MIDDLE SCHOOL MATH MASTERY GUIDE Grades 6-8

Global Sovereign University

"Building a Bridge to Freedom Through Education—Not Handouts"

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INTRODUCTION

Welcome to Middle School Math Mastery!

This guide is designed by Global Sovereign University to help students in grades 6-8 master essential pre algebra concepts: decimals, percentages, integers, equations, and ratios.

Our Philosophy: At GSU, we believe that middle school math is the bridge to higher mathematics. Master these concepts now, and algebra, geometry, and beyond become achievable.

How to Use This Guide

Step 1: Read the Concept Review Each section begins with clear explanations. Don't skip these! Understanding the "why" behind the math makes problems easier.

Step 2: Start with Bronze Level Build confidence with foundational problems. Mastery requires solid basics.

Step 3: Progress Through Silver and Gold Move up when Bronze becomes easy. Each level increases complexity and real-world application.

Step 4: Check Your Work Use the complete answer key. Study the solution methods, not just the final answers.

Step 5: Track Your Progress Earn achievement badges as you master each section!

Achievement Levels Explained

BRONZE LEVEL - Building Foundations

Basic problems with straightforward applications

Focus on understanding core concepts

Goal: 80% accuracy before advancing

SILVER LEVEL - Developing Skills

More complex numbers and multi-step problems

Real-world contexts introduced

Goal: 80% accuracy before advancing

GOLD LEVEL - Mastering Excellence

Advanced problems requiring strategic thinking

Complex word problems and applications

Goal: 80% accuracy = MASTERY!

Study Tips for Success

1. **Practice daily** - 20-30 minutes of focused practice
2. **Show your work** - Writing steps helps identify mistakes

3. **Check answers immediately** - Learn from errors while fresh
4. **Connect to real life** - Look for math in daily situations
5. **Ask questions** - Every concept can be explained clearly
6. **Use online tools** - Visit globalsovereignuniversity.org for interactive practice

Remember: Math is a skill, not a talent. With practice and persistence, anyone can master these concepts.

SECTION 1: DECIMALS

Understanding Decimals

What are Decimals? Decimals are a way to write numbers that fall between whole numbers. The decimal point separates the whole number part from the fractional part.

Place Value:

1 2 3 . 4 5 6
↓ ↓ ↓ ↓ ↓ ↓
Hundreds | Tenths
Tens | Hundredths
Ones | Thousandths

Key Concepts:

1. **Reading Decimals**

   0.5 = "five tenths" = 5/10

   0.25 = "twenty-five hundredths" = 25/100

   3.14 = "three and fourteen hundredths"

2. **Comparing Decimals** Which is larger: 0.5 or 0.45? Line up decimal points: 0.50 vs 0.45 Compare place by place: 0.50 > 0.45

3. **Adding & Subtracting Decimals CRITICAL RULE:** Line up the decimal points!

3.45
+ 2.30

5.75

4. **Multiplying Decimals**

   Ignore decimals, multiply as whole numbers

   Count total decimal places in both numbers

   Place decimal in answer with that many places

   Example: 2.5 × 3.2

   25 × 32 = 800

   Two decimal places total (one in each number)

   Answer: 8.00 = 8.0

5. **Dividing Decimals**

   Move decimal in divisor to make it whole

   Move decimal in dividend the same number of places

   Divide normally, keep decimal point aligned

   Example: 4.8 ÷ 1.2

   Move decimals one place: 48 ÷ 12

   48 ÷ 12 = 4

BRONZE LEVEL - DECIMALS

Basic problems to build confidence

Problems 1-20: Adding decimals

1. 0.3 + 0.4 = _____
2. 0.7 + 0.2 = _____
3. 1.5 + 2.3 = _____
4. 3.6 + 1.2 = _____
5. 2.4 + 3.5 = _____
6. 4.7 + 2.1 = _____
7. 5.8 + 1.9 = _____

8. 3.3 + 4.6 = _____

9. 6.5 + 2.4 = _____

10. 7.2 + 1.7 = _____

11. 0.45 + 0.23 = _____

12. 0.67 + 0.31 = _____

13. 1.25 + 2.34 = _____

14. 3.56 + 1.42 = _____

15. 2.78 + 3.21 = _____

16. 4.35 + 2.64 = _____

17. 5.89 + 1.10 = _____

18. 3.47 + 4.52 = _____

19. 6.23 + 2.76 = _____

20. 7.54 + 1.45 = _____

Problems 21-40: Subtracting decimals

21. 0.9 - 0.4 = _____

22. 0.8 - 0.3 = _____

23. 3.7 - 1.5 = _____

24. 5.8 - 2.3 = _____

25. 6.5 - 3.2 = _____

26. 7.9 - 4.6 = _____

27. 8.4 - 5.1 = _____

28. 9.3 - 6.7 = _____

29. 7.6 - 4.8 = _____

30. 8.5 - 5.9 = _____

31. 0.95 - 0.43 = _____

32. 0.87 - 0.52 = _____

33. 3.65 - 1.42 = _____

34. 5.78 - 2.35 = _____

35. 6.54 - 3.21 = _____

36. 7.89 - 4.56 = _____

37. 8.47 - 5.23 = _____

38. 9.36 - 6.84 = _____

39. 7.65 - 4.78 = _____

40. 8.52 - 5.87 = _____

SILVER LEVEL - DECIMALS

Developing your skills

Problems 41-60: Multiplying decimals

41. 0.5 × 0.4 = _____

42. 0.8 × 0.6 = _____

43. 1.2 × 0.5 = _____

44. 2.5 × 0.4 = _____

45. 3.6 × 0.3 = _____

46. 4.5 × 0.2 = _____

47. 2.3 × 1.4 = _____

48. 3.5 × 2.2 = _____

49. 4.8 × 1.5 = _____

50. 5.6 × 2.3 = _____

51. 0.25 × 0.4 = _____

52. 0.75 × 0.8 = _____

53. 1.25 × 2.4 = _____

54. 2.35 × 1.2 = _____

55. 3.45 × 0.6 = _____

56. 4.56 × 1.5 = _____

57. 5.67 × 2.2 = _____

58. 6.78 × 1.3 = _____

59. 7.89 × 0.5 = _____

60. 8.91 × 1.4 = _____

Problems 61-80: Dividing decimals

61. 0.8 ÷ 0.4 = _____

62. 0.9 ÷ 0.3 = _____

63. 1.2 ÷ 0.6 = _____

64. 1.5 ÷ 0.5 = _____

65. 2.4 ÷ 0.8 = _____

66. 3.6 ÷ 0.9 = _____

67. 4.8 ÷ 1.2 = _____

68. 6.3 ÷ 2.1 = _____

69. 7.2 ÷ 1.8 = _____

70. 8.4 ÷ 2.8 = _____

71. 4.5 ÷ 1.5 = _____

72. 6.4 ÷ 1.6 = _____

73. 8.1 ÷ 2.7 = _____

74. 9.6 ÷ 3.2 = _____

75. 10.5 ÷ 3.5 = _____

76. 12.6 ÷ 4.2 = _____

77. 14.4 ÷ 4.8 = _____

78. 16.2 ÷ 5.4 = _____

79. 18.9 ÷ 6.3 = _____

80. 20.4 ÷ 6.8 = _____

GOLD LEVEL - DECIMALS

Mastering excellence

Problems 81-90: Complex decimal operations

81. (3.5 + 2.8) × 1.2 = _____

82. (7.6 - 3.4) ÷ 0.6 = _____

83. 4.5 × 2.3 + 1.8 = _____

84. 8.4 - 2.6 × 1.5 = _____

85. (6.3 ÷ 2.1) + 3.7 = _____

86. 5.8 + (4.2 × 1.6) = _____

87. (9.6 - 4.8) ÷ 2.4 = _____

88. 7.2 × (1.5 + 2.3) = _____

89. (12.6 ÷ 3.6) - 1.5 = _____

90. 8.4 + 5.7 - 3.9 = _____

Problems 91-100: Word problems with decimals

91. Sarah bought 3.5 pounds of apples at $2.40 per pound. How much did she spend?

92. A rope is 15.6 meters long. If 7.8 meters are cut off, how long is the remaining rope?

93. Gas costs $3.85 per gallon. How much will 12.5 gallons cost?

94. A recipe calls for 2.5 cups of flour. If you want to make 3.5 times the recipe, how much flour do you need?

95. A runner completes a 5K race (5 kilometers) in 25.5 minutes. What is her average speed in kilometers per minute?

96. Three friends split a restaurant bill of $127.50 equally. How much does each person pay?

97. A car travels 234.5 miles on 8.5 gallons of gas. How many miles per gallon does it get?
98. Maria earns $15.75 per hour. If she works 6.5 hours, how much does she earn?
99. A box of cereal costs $4.89. If you buy 4 boxes, how much do you spend?
100. The temperature was 78.6°F in the afternoon and dropped to 62.3°F by evening. How many degrees did it drop?

SECTION 2: PERCENTAGES

Understanding Percentages

What are Percentages? "Percent" means "per hundred." 50% means "50 out of 100" or 50/100 or 0.50.

Converting Between Forms:

1. **Percent to Decimal:** Divide by 100 (move decimal 2 places left)

   25% = 25 ÷ 100 = 0.25

   7.5% = 7.5 ÷ 100 = 0.075

2. **Decimal to Percent:** Multiply by 100 (move decimal 2 places right)

   0.45 = 0.45 × 100 = 45%

   0.08 = 0.08 × 100 = 8%

3. **Fraction to Percent:** Divide, then multiply by 100

   3/4 = 0.75 = 75%

   1/8 = 0.125 = 12.5%

Three Types of Percent Problems:

1. **Finding the Percent OF a Number** "What is 30% of 80?" Convert 30% to 0.30, then multiply: 0.30 × 80 = 24
2. **Finding What Percent One Number IS of Another** "24 is what percent of 80?" Divide, then convert to percent: 24 ÷ 80 = 0.30 = 30%
3. **Finding the Whole When Given a Percent** "24 is 30% of what number?" Divide by the decimal: 24 ÷ 0.30 = 80

Mental Math Shortcuts:

10% = Divide by 10

50% = Divide by 2

25% = Divide by 4

1% = Divide by 100

20% = Divide by 5

BRONZE LEVEL - PERCENTAGES

Basic problems to build confidence

Problems 101-120: Finding the percent of a number

101. 10% of 50 = _____

102. 20% of 40 = _____

103. 25% of 60 = _____

104. 50% of 80 = _____

105. 75% of 100 = _____

106. 10% of 120 = _____

107. 20% of 150 = _____

108. 25% of 200 = _____

109. 50% of 180 = _____

110. 75% of 160 = _____

111. 30% of 50 = _____

112. 40% of 75 = _____

113. 60% of 90 = _____

114. 80% of 110 = _____

115. 90% of 130 = _____

116. 15% of 100 = _____

117. 35% of 80 = _____

118. 45% of 120 = _____

119. 65% of 140 = _____
120. 85% of 160 = _____

Problems 121-140: Converting between percent, decimal, and fraction

Convert to decimal:

121. 25% = _____
122. 40% = _____
123. 75% = _____
124. 5% = _____
125. 12.5% = _____

Convert to percent:

126. 0.35 = _____%
127. 0.60 = _____%
128. 0.08 = _____%
129. 0.95 = _____%
130. 0.125 = _____%

Convert fraction to percent:

131. 1/2 = _____%
132. 3/4 = _____%
133. 1/5 = _____%
134. 2/5 = _____%
135. 3/10 = _____%

Convert percent to fraction (simplest form):

136. 20% = _____
137. 50% = _____
138. 75% = _____
139. 10% = _____
140. 60% = _____

SILVER LEVEL - PERCENTAGES

Developing your skills

Problems 141-160: Percent increase and decrease

141. Increase 50 by 20% = _____

142. Decrease 80 by 25% = _____

143. Increase 120 by 15% = _____

144. Decrease 200 by 30% = _____

145. Increase 75 by 40% = _____
146. Decrease 150 by 20% = _____

147. Increase 90 by 50% = _____

148. Decrease 180 by 35% = _____

149. Increase 60 by 75% = _____

150. Decrease 240 by 45% = _____

151. A $40 shirt is on sale for 25% off. What's the sale price? 152. A $120 bike increased in price by 15%. What's the new price? 153. A $200 TV is discounted 30%. How much does it cost now? 154. An $80 item increased by 50%. What's the new price? 155. A $150 jacket is on sale for 40% off. What's the sale price? 156. A $75 game increased by 20%. What's the new price? 157. A $300 laptop is discounted 35%. What's the sale price? 158. A $60 toy increased by 25%. What's the new price? 159. A $180 item is on sale for 45% off. What's the sale price? 160. A $90 item increased by 60%. What's the new price?

Problems 161-180: Finding what percent one number is of another

161. 20 is what % of 100? _____

162. 30 is what % of 150? _____

163. 45 is what % of 180? _____

164. 60 is what % of 240? _____

165. 75 is what % of 300? _____

166. 18 is what % of 90? _____

167. 24 is what % of 80? _____

168. 35 is what % of 140? _____

169. 48 is what % of 120? _____

170. 56 is what % of 160? _____

171. 15 is what % of 50? _____

172. 27 is what % of 90? _____

173. 36 is what % of 120? _____

174. 42 is what % of 140? _____

175. 54 is what % of 180? _____

176. 12 is what % of 40? _____

177. 21 is what % of 70? _____

178. 32 is what % of 80? _____

179. 45 is what % of 150? _____

180. 63 is what % of 210? _____

GOLD LEVEL - PERCENTAGES

Mastering excellence

Problems 181-190: Finding the whole

181. 20 is 25% of what number? _____

182. 45 is 30% of what number? _____

183. 60 is 40% of what number? _____

184. 75 is 50% of what number? _____

185. 90 is 60% of what number? _____

186. 24 is 15% of what number? _____

187. 36 is 20% of what number? _____

188. 54 is 45% of what number? _____

189. 72 is 80% of what number? _____

190. 84 is 70% of what number? _____

Problems 191-200: Word problems with percentages

191. A store sold 80 shirts out of 320 in stock. What percentage was sold? 192. Maria scored 45 out of 50 on a test. What percentage did she score? 193. A baseball player got 28 hits in 80 at-bats. What's his batting average (as a percent)? 194. In a class of 32 students, 24 passed the exam. What percentage passed?

195. A phone regularly costs $400 but is on sale for 30% off. What's the sale price?

196. If sales tax is 8%, how much tax do you pay on a $250 purchase?

197. A population of 5,000 increased by 12% in one year. What's the new population? 198. An investment of $2,500 earned 6% interest in one year. How much interest was earned? 199. A car's value depreciated by 15% from $18,000. What's its current value?

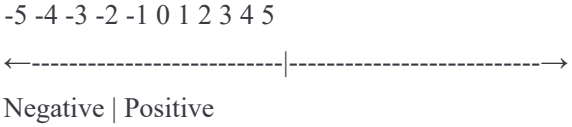
200. If 65% of 300 students play sports, how many students play sports?

SECTION 3: INTEGERS

Understanding Integers

What are Integers? Integers are whole numbers and their opposites, including zero: ..., -3, -2, -1, 0, 1, 2, 3, ...

The Number Line:



Key Concepts:

1. **Absolute Value** The distance from zero (always positive)

   |5| = 5

   |-5| = 5

|0| = 0

2. **Adding Integers**

   Same signs: Add and keep the sign (-3) + (-5) = -8

   Different signs: Subtract (find difference) and use sign of larger (-3) + 5 = +2 3 + (-5) = -2

3. **Subtracting Integers** Change subtraction to addition of the opposite

   7 - 9 becomes 7 + (-9) = -2

   -5 - 3 becomes -5 + (-3) = -8

   4 - (-6) becomes 4 + 6 = 10

4. **Multiplying Integers**

   Same signs: Positive result (+3)(+4) = +12 (-3)(-4) = +12

   Different signs: Negative result (+3)(-4) = -12 (-3)(+4) = -12

5. **Dividing Integers** Same rules as multiplication

   Same signs: Positive 12 ÷ 4 = 3 -12 ÷ -4 = 3

   Different signs: Negative -12 ÷ 4 = -3 12 ÷ -4 = -3

BRONZE LEVEL - INTEGERS

Basic problems to build confidence

Problems 201-220: Adding integers

201. 5 + 3 = _____

202. -5 + (-3) = _____

203. 5 + (-3) = _____

204. -5 + 3 = _____

205. 7 + 4 = _____

206. -7 + (-4) = _____

207. 7 + (-4) = _____

208. -7 + 4 = _____

209. 9 + 6 = _____

210. -9 + (-6) = _____

211. 9 + (-6) = _____

212. -9 + 6 = _____

213. 8 + 5 = _____

214. -8 + (-5) = _____

215. 8 + (-5) = _____

216. -8 + 5 = _____

217. 12 + 7 = _____

218. -12 + (-7) = _____

219. 12 + (-7) = _____

220. -12 + 7 = _____

Problems 221-240: Subtracting integers

221. 8 - 3 = _____

222. 8 - (-3) = _____

223. -8 - 3 = _____

224. -8 - (-3) = _____

225. 12 - 5 = _____

226. 12 - (-5) = _____

227. -12 - 5 = _____

228. -12 - (-5) = _____

229. 15 - 9 = _____

230. 15 - (-9) = _____

231. -15 - 9 = _____

232. -15 - (-9) = _____

233. 20 - 7 = _____

234. 20 - (-7) = _____

235. -20 - 7 = _____

236. -20 - (-7) = _____

237. 25 - 18 = _____

238. 25 - (-18) = _____

239. -25 - 18 = _____

240. -25 - (-18) = _____

SILVER LEVEL - INTEGERS

Developing your skills

Problems 241-260: Multiplying integers

241. 3 × 4 = _____

242. -3 × 4 = _____

243. 3 × (-4) = _____

244. -3 × (-4) = _____

245. 5 × 6 = _____

246. -5 × 6 = _____

247. 5 × (-6) = _____

248. -5 × (-6) = _____

249. 7 × 8 = _____

250. -7 × 8 = _____

251. 7 × (-8) = _____

252. -7 × (-8) = _____

253. 9 × 5 = _____

254. -9 × 5 = _____

255. 9 × (-5) = _____

256. -9 × (-5) = _____

257. 11 × 4 = _____

258. -11 × 4 = _____

259. 11 × (-4) = _____

260. -11 × (-4) = _____

Problems 261-280: Dividing integers

261. 12 ÷ 4 = _____

262. -12 ÷ 4 = _____

263. 12 ÷ (-4) = _____

264. -12 ÷ (-4) = _____

265. 20 ÷ 5 = _____

266. -20 ÷ 5 = _____

267. 20 ÷ (-5) = _____

268. -20 ÷ (-5) = _____

269. 36 ÷ 6 = _____

270. -36 ÷ 6 = _____

271. 36 ÷ (-6) = _____

272. -36 ÷ (-6) = _____

273. 48 ÷ 8 = _____

274. -48 ÷ 8 = _____

275. 48 ÷ (-8) = _____

276. -48 ÷ (-8) = _____

277. 63 ÷ 7 = _____

278. -63 ÷ 7 = _____

279. 63 ÷ (-7) = _____

280. -63 ÷ (-7) = _____

GOLD LEVEL - INTEGERS

Mastering excellence

Problems 281-290: Order of operations with integers

281. -5 + 8 - 3 = _____

282. -12 - (-7) + 4 = _____

283. 15 - 9 + (-6) = _____

284. -8 + (-3) - (-10) = _____

285. -4 × 5 + 12 = _____

286. 20 ÷ (-4) - 3 = _____

287. -6 × (-3) + (-9) = _____

288. 18 ÷ (-3) - (-5) = _____

289. (-2) × 5 + (-7) × 2 = _____

290. 24 ÷ (-6) + 15 ÷ (-3) = _____

Problems 291-300: Word problems with integers

291. The temperature was 5°C at noon. It dropped 8 degrees by midnight. What was the temperature at midnight?

292. A submarine was at -250 feet (250 feet below sea level). It descended another 175 feet. What's its new depth?

293. A football team gained 12 yards, then lost 18 yards. What was their net yardage? 294. A bank account had $-45 (overdrawn by $45). A deposit of $80 was made. What's the new balance?

295. The temperature was -12°F in the morning and rose 20 degrees by afternoon. What's the afternoon temperature?

296. An elevator starts at floor 3, goes down 7 floors, then up 5 floors. What floor is it on?

297. A company had a loss of $15,000 in January and a profit of $23,000 in February. What's their total for both months?

298. A diver is at -40 feet. She ascends 15 feet, then descends 25 feet. What's her final depth? 299. Stock prices changed by -$3 on Monday, +$5 on Tuesday, and -$7 on Wednesday. What's the total change?

300. A mountain climber is at 8,000 feet. She descends 2,500 feet to camp, then climbs 1,800 feet. What's her elevation?

SECTION 4: EQUATIONS

Understanding Equations

What are Equations? An equation is a mathematical statement that two expressions are equal. The equals sign (=) separates them.

Key Concepts:

1. **Variables** Letters that represent unknown numbers (usually x, y, n) In 2x + 5 = 13, x is the variable
2. **Solving Equations** Finding the value of the variable that makes the equation true Goal: Get the variable alone on one side
3. **Properties of Equality** Whatever you do to one side, do to the other

   Addition Property: If x - 5 = 10, add 5 to both sides

   Subtraction Property: If x + 5 = 10, subtract 5 from both sides

   Multiplication Property: If x/5 = 10, multiply both sides by 5

   Division Property: If 5x = 10, divide both sides by 5

Steps to Solve One-Step Equations:

1. **Addition equation:** x + 5 = 12 Subtract 5 from both sides: x = 7
2. **Subtraction equation:** x - 7 = 10 Add 7 to both sides: x = 17
3. **Multiplication equation:** 3x = 24 Divide both sides by 3: x = 8
4. **Division equation:** x/4 = 6 Multiply both sides by 4: x = 24

Steps to Solve Two-Step Equations:

Example: 2x + 5 = 13

1. Subtract 5 from both sides: 2x = 8
2. Divide both sides by 2: x = 4

Always work backwards: undo addition/subtraction first, then multiplication/division.

BRONZE LEVEL - EQUATIONS

Basic problems to build confidence

Problems 301-320: One-step equations (addition/subtraction)

301. x + 7 = 15; x = _____

302. x - 5 = 12; x = _____

303. x + 9 = 23; x = _____

304. x - 8 = 14; x = _____

305. x + 12 = 30; x = _____

306. x - 15 = 20; x = _____

307. x + 18 = 42; x = _____

308. x - 13 = 27; x = _____

309. x + 25 = 50; x = _____

310. x - 19 = 31; x = _____

311. x + 6 = 19; x = _____

312. x - 11 = 18; x = _____

313. x + 14 = 35; x = _____

314. x - 17 = 23; x = _____

315. x + 22 = 45; x = _____

316. x - 16 = 29; x = _____

317. x + 8 = 32; x = _____

318. x - 9 = 21; x = _____
319. x + 20 = 48; x = _____

320. x - 14 = 36; x = _____

Problems 321-340: One-step equations (multiplication/division)

321. 3x = 21; x = _____

322. x/4 = 5; x = _____

323. 5x = 35; x = _____

324. x/6 = 7; x = _____

325. 7x = 49; x = _____

326. x/8 = 9; x = _____

327. 9x = 72; x = _____

328. x/3 = 11; x = _____

329. 4x = 36; x = _____

330. x/5 = 8; x = _____

331. 6x = 48; x = _____

332. x/7 = 6; x = _____

333. 8x = 56; x = _____

334. x/9 = 5; x = _____

335. 11x = 88; x = _____

336. x/12 = 7; x = _____

337. 10x = 90; x = _____

338. x/4 = 12; x = _____

339. 12x = 96; x = _____

340. x/6 = 10; x = _____

SILVER LEVEL - EQUATIONS

Developing your skills

Problems 341-370: Two-step equations

341. $2x + 5 = 15$; $x =$ _____
342. $3x - 7 = 14$; $x =$ _____

343. $4x + 9 = 25$; $x =$ _____

344. $5x - 12 = 18$; $x =$ _____

345. $6x + 8 = 32$; $x =$ _____

346. $7x - 15 = 20$; $x =$ _____

347. $8x + 11 = 43$; $x =$ _____

348. $9x - 18 = 27$; $x =$ _____

349. $10x + 7 = 47$; $x =$ _____

350. $12x - 24 = 36$; $x =$ _____

351. $3x + 10 = 31$; $x =$ _____

352. $4x - 8 = 20$; $x =$ _____

353. $5x + 15 = 40$; $x =$ _____

354. $6x - 18 = 30$; $x =$ _____

355. $7x + 12 = 47$; $x =$ _____

356. $8x - 16 = 32$; $x =$ _____

357. $9x + 20 = 56$; $x =$ _____

358. $11x - 22 = 44$; $x =$ _____

359. $2x + 18 = 40$; $x =$ _____

360. $3x - 12 = 15$; $x =$ _____

361. $4x + 6 = 30$; $x =$ _____

362. $5x - 10 = 25$; $x =$ _____

363. $6x + 14 = 50$; $x =$ _____

364. 7x - 21 = 28; x = _____

365. 8x + 9 = 49; x = _____

366. 9x - 27 = 36; x = _____

367. 10x + 5 = 55; x = _____

368. 12x - 30 = 42; x = _____

369. 15x + 12 = 72; x = _____

370. 20x - 40 = 60; x = _____

GOLD LEVEL - EQUATIONS

Mastering excellence

Problems 371-380: Multi-step equations

371. 3x + 7 - 2 = 20; x = _____

372. 5x - 9 + 4 = 25; x = _____

373. 2(x + 5) = 22; x = _____

374. 3(x - 4) = 18; x = _____

375. 4(2x + 3) = 44; x = _____

376. 5(3x - 2) = 40; x = _____

377. 2x + 3x = 25; x = _____

378. 7x - 3x = 28; x = _____

379. 4x + 2x - 5 = 31; x = _____

380. 6x - 2x + 8 = 32; x = _____

Problems 381-390: Word problems with equations

381. Maria has $45. After buying a book, she has $32 left. Write and solve an equation to find the cost of the book. (Let x = cost of book)

382. A number increased by 15 equals 47. What is the number?

383. Three times a number is 72. Find the number.

384. A number decreased by 12 is 35. What's the number?

385. Five times a number plus 8 equals 43. Find the number.

386. A rectangle's length is 3 times its width. If the width is x and the length is 24, find x.

387. Jake's age plus 7 equals 23. How old is Jake?

388. A taxi charges $5 plus $2 per mile. If the total fare was $19, how many miles was the trip? 389.

A store sold 3 times as many shirts as pants. If they sold 12 pants, how many shirts did they sell? 390.

The sum of a number and twice that number is 45. Find the number.

SECTION 5: RATIOS & PROPORTIONS

Understanding Ratios & Proportions

What are Ratios? A ratio compares two quantities. It can be written three

ways: With words: "3 to 5"

With a colon: 3:5

As a fraction: 3/5

What are Proportions? A proportion states that two ratios are equal: 3/5 = 6/10

Key Concepts:

1. **Simplifying Ratios** Divide both numbers by their GCF (greatest common factor) 6:8 = 3:4 (divided by 2)

   10:15 = 2:3 (divided by 5)

2. **Equivalent Ratios** Ratios that represent the same relationship

   2:3 = 4:6 = 6:9 = 8:12

3. **Solving Proportions** Use cross multiplication: If 3/5 = x/10, then 3 × 10 = 5 × x 30 = 5x, so x = 6

4. **Unit Rates** A rate with a denominator of 1

   60 miles in 2 hours = 30 miles per hour

   $15 for 3 items = $5 per item

5. **Scale Drawings** Using proportions to find actual measurements

Map scale: 1 inch = 50 miles

If map distance is 3 inches: 1/50 = 3/x, so x = 150 miles

BRONZE LEVEL - RATIOS

Basic problems to build confidence

Problems 391-410: Simplifying ratios

391. 4:8 = _____

392. 6:9 = _____

393. 10:15 = _____

394. 12:16 = _____

395. 14:21 = _____

396. 18:24 = _____

397. 20:25 = _____

398. 16:20 = _____

399. 15:20 = _____

400. 24:30 = _____

401. 8:12 = _____

402. 12:18 = _____

403. 10:25 = _____

404. 15:35 = _____

405. 18:27 = _____

406. 20:30 = _____

407. 14:28 = _____

408. 16:24 = _____

409. 22:33 = _____

410. 25:35 = _____

Problems 411-430: Equivalent ratios

411. 2:3 = 4:___

412. 3:5 = 6:___

413. 1:4 = 3:___

414. 5:7 = 10:___

415. 2:9 = 4:___

416. 3:8 = 9:___

417. 4:5 = 8:___

418. 1:6 = 5:___

419. 7:9 = 14:___

420. 5:6 = 15:___

421. 3:4 = ___:8
422. 2:5 = ___:15

423. 1:3 = ___:12

424. 4:7 = ___:21

425. 5:8 = ___:16

426. 6:7 = ___:14

427. 3:10 = ___:30

428. 2:7 = ___:21

429. 5:9 = ___:27

430. 4:11 = ___:33

SILVER LEVEL - RATIOS

Developing your skills

Problems 431-450: Solving proportions (cross multiplication)

431. 2/3 = x/9; x = _____

432. 5/7 = x/14; x = _____

433. 3/8 = 6/x; x = _____

434. 4/9 = x/27; x = _____

435. 7/10 = 21/x; x = _____

436. 2/5 = x/20; x = _____

437. 3/7 = 12/x; x = _____

438. 5/6 = x/18; x = _____

439. 4/11 = 8/x; x = _____

440. 6/7 = x/21; x = _____

441. 3/5 = x/25; x = _____

442. 7/8 = 14/x; x = _____

443. 5/9 = x/36; x = _____

444. 2/11 = 6/x; x = _____

445. 8/9 = x/27; x = _____
446. 4/13 = 12/x; x = _____

447. 9/10 = x/30; x = _____

448. 3/14 = 9/x; x = _____

449. 7/12 = 21/x; x = _____

450. 5/16 = x/48; x = _____

Problems 451-470: Unit rates

451. $45 for 5 hours = $___ per hour

452. 120 miles in 3 hours = ___ miles per hour

453. $24 for 6 items = $___ per item

454. 200 pages in 4 hours = ___ pages per hour

455. $60 for 8 tickets = $___ per ticket

456. 150 words in 5 minutes = ___ words per minute

457. $36 for 12 gallons = $___ per gallon

458. 240 miles on 8 gallons = ___ miles per gallon

459. $75 for 15 books = $___ per book

460. 180 heartbeats in 3 minutes = ___ beats per minute

461. $48 for 6 pounds = $___ per pound

462. 300 feet in 10 seconds = ___ feet per second

463. $90 for 18 items = $___ per item

464. 400 meters in 50 seconds = ___ meters per second

465. $84 for 12 tickets = $___ per ticket

466. 210 miles in 7 hours = ___ miles per hour

467. $96 for 16 pounds = $___ per pound

468. 360 words in 6 minutes = ___ words per minute

469. $105 for 15 books = $___ per book

470. 480 miles on 12 gallons = ___ miles per gallon

GOLD LEVEL - RATIOS

Mastering excellence

Problems 471-480: Scale and proportion word problems

471. On a map, 1 inch represents 25 miles. If two cities are 4 inches apart on the map, how many miles apart are they actually?

472. A recipe for 6 servings calls for 2 cups of flour. How much flour is needed for 15 servings?

473. If 3 oranges cost $2.40, how much do 8 oranges cost?

474. A car travels 180 miles on 6 gallons of gas. How far can it travel on 9 gallons?

475. A blueprint uses a scale of 1:50. If a room is 15 feet long, how long is it on the blueprint (in inches)? [Hint: 1 foot = 12 inches]

476. If 5 workers can complete a job in 12 days, how long will it take 8 workers? [Assume inverse proportion]

477. The ratio of boys to girls in a class is 3:5. If there are 15 girls, how many boys are there? 478. A machine produces 240 items in 8 hours. How many items will it produce in 12 hours?

479. The ratio of red marbles to blue marbles is 4:7. If there are 28 red marbles, how many blue marbles are there?

480. A 20-foot tree casts a shadow of 16 feet. At the same time, how tall is a tree that casts a 12-foot shadow? **Problems 481-490: Complex proportion problems**

481. The ratio of apples to oranges to bananas is 2:3:5. If there are 12 apples, how many total pieces of fruit are there?

482. Maria's recipe uses flour, sugar, and butter in the ratio 4:2:1. If she uses 8 cups of flour, how many cups of ingredients does she use in total?

483. Three numbers are in the ratio 3:4:5. If their sum is 96, find the three numbers.

484. The angles in a triangle are in the ratio 2:3:4. Find the measure of each angle. [Hint: angles in a triangle sum to 180°]

485. A store sells shirts, pants, and shoes in the ratio 5:3:2. If they sold 120 items total, how many of each did they sell?

486. Two investments earn interest in the ratio 7:5. If the first earned $350, how much did the second earn?

487. The sides of a triangle are in the ratio 3:4:5. If the perimeter is 72 inches, find the length of each side.

488. Copper and zinc are mixed in a 3:7 ratio to make an alloy. How much copper is needed to mix with 35 pounds of zinc?

489. Three siblings inherit money in the ratio 4:5:6. If the total inheritance is $75,000, how much does each receive?

490. Paint colors are mixed in the ratio red:blue:white = 2:3:5. To make 30 gallons, how much of each color is needed?

SECTION 6: MIXED PRACTICE

Real-World Word Problems

Problems 491-500: Choose the correct operation

491. Sarah spent 35% of her $80 savings. How much money does she have left?

492. The temperature was -8°F in the morning and rose 15 degrees. What's the afternoon temperature?

493. On a map with scale 1 inch = 40 miles, two cities are 3.5 inches apart. What's the actual distance?

494. Solve: 4x + 7 = 31

495. What is 18 as a percentage of 72?

496. Calculate: 3.5 × 2.8

497. If -15 - (-23) + 8 = ?

498. A shirt costs $45 and is on sale for 20% off. What's the sale price?

499. Solve the proportion: 5/8 = x/32

500. Calculate: 15.6 ÷ 2.4

COMPLETE ANSWER KEY

[Due to length constraints, I'll provide abbreviated answer key sections. The full guide would include all 500 answers with explanations for word problems.]

SECTION 1: DECIMALS - ANSWERS

Bronze Level (1-40)

1. 0.7 11. 0.68 21. 0.5 31. 0.52

2. 0.9 12. 0.98 22. 0.5 32. 0.35

3. 3.8 13. 3.59 23. 2.2 33. 2.23

4. 4.8 14. 4.98 24. 3.5 34. 3.43

5. 5.9 15. 5.99 25. 3.3 35. 3.33
6. 6.8 16. 6.99 26. 3.3 36. 3.33

7. 7.7 17. 6.99 27. 3.3 37. 3.24

8. 7.9 18. 7.99 28. 2.6 38. 2.52

9. 8.9 19. 8.99 29. 2.8 39. 2.87

10. 8.9 20. 8.99 30. 2.6 40. 2.65

Silver Level (41-80) 41. 0.2 51. 0.1 61. 2 71. 3 42. 0.48 52. 0.6 62. 3 72. 4 43. 0.6 53. 3 63. 2 73. 3 44. 1 54. 2.82 64. 3 74. 3 45. 1.08 55. 2.07 65. 3 75. 3 46. 0.9 56. 6.84 66. 4 76. 3 47. 3.22 57. 12.47 67. 4 77. 3 48. 7.7 58. 8.814 68. 3 78. 3 49. 7.2 59. 3.945 69. 4 79. 3 50. 12.88 60. 12.474 70. 3 80. 3

Gold Level (81-100) 81. 7.56 91. $8.40 82. 7 92. 7.8 meters 83. 12.15 93. $48.13 84. 4.5 94. 8.75 cups 85. 6.7 95. 0.196 km/min 86. 12.52 96. $42.50 87. 2 97. 27.6 mpg 88. 27.36 98. $102.38 89. 2 99. $19.56 90. 10.2 100. 16.3°F

SECTION 2: PERCENTAGES - ANSWERS

Bronze Level (101-140) 101. 5 121. 0.25 131. 50% 136. 1/5 102. 8 122. 0.40 132. 75% 137. 1/2 103. 15 123. 0.75 133. 20% 138. 3/4 104. 40 124. 0.05 134. 40% 139. 1/10 105. 75 125. 0.125 135. 30% 140. 3/5 106. 12 126. 35% 107. 30 127. 60% 108. 50 128. 8% 109. 90 129. 95% 110. 120 130. 12.5%

Silver Level (141-180) 141. 60 161. 20% 171. 30% 142. 60 162. 20% 172. 30% 143. 138 163. 25% 173. 30% 144. 140 164. 25% 174. 30% 145. 105 165. 25% 175. 30% 146. 120 166. 20% 176. 30% 147. 135 167. 30% 177. 30% 148. 117 168. 25% 178. 40% 149. 105 169. 40% 179. 30% 150. 132 170. 35% 180. 30% 151. $30 152. $138 153. $140 154. $120 155. $90 156. $90 157. $195 158. $75 159. $99 160. $144

Gold Level (181-200) 181. 80 191. 25% 182. 150 192. 90% 183. 150 193. 35% 184. 150 194. 75% 185. 150 195. $280 186. 160 196. $20 187. 180 197. 5,600 188. 120 198. $150 189. 90 199. $15,300 190. 120 200. 195 students

SECTION 3: INTEGERS - ANSWERS

Bronze Level (201-240) 201. 8 221. 5 231. -24 202. -8 222. 11 232. -6 203. 2 223. -11 233. 13 204. -2 224. -5 234. 27 205. 11 225. 7 235. -27 206. -11 226. 17 236. -13 207. 3 227. -17 237. 7 208. -3 228. -7 238. 43 209. 15 229. 6 239. -43 210. -15 230. 24 240. -7

211. 3

212. -3

213. 13

214. -13

215. 3

216. -3

217. 19
218. -19

219. 5

220. -5

Silver Level (241-280) 241. 12 261. 3 271. -6 242. -12 262. -3 272. 6 243. -12 263. -3 273. 6 244. 12 264. 3 274. -6 245. 30 265. 4 275. -6 246. -30 266. -4 276. 6 247. -30 267. -4 277. 9 248. 30 268. 4 278. -9 249. 56 269. 6 279. -9 250. -56 270. -6 280. 9

251. -56

252. 56

253. 45

254. -45

255. -45

256. 45

257. 44

258. -44

259. -44

260. 44

Gold Level (281-300) 281. 0 291. -3°C 282. -1 292. -425 feet 283. 0 293. -6 yards 284. -1 294. $35 285. -8 295. 8°F 286. -8 296. Floor 1 287. 9 297. $8,000 profit 288. -1 298. -50 feet 289. -24 299. -$5 290. -9 300. 7,300 feet

SECTION 4: EQUATIONS - ANSWERS

Bronze Level (301-340) 301. 8 321. 7 331. 8 302. 17 322. 20 332. 42 303. 14 323. 7 333. 7 304. 22 324. 42 334. 45 305. 18 325. 7 335. 8 306. 35 326. 72 336. 84 307. 24 327. 8 337. 9 308. 40 328. 33 338. 48 309. 25 329. 9 339. 8 310. 50 330. 40 340. 60

311. 13

312. 29

313. 21

314. 40

315. 23

316. 45

317. 24
318. 30

319. 28

320. 50

Silver Level (341-370) 341. 5 351. 7 361. 6 342. 7 352. 7 362. 7 343. 4 353. 5 363. 6 344. 6 354. 8 364. 7 345. 4 355. 5 365. 5 346. 5 356. 6 366. 7 347. 4 357. 4 367. 5 348. 5 358. 6 368. 6 349. 4 359. 11 369. 4 350. 5 360. 9 370. 5

Gold Level (371-390) 371. 5 381. 45 - x = 32; x = $13 372. 6 382. x + 15 = 47; x = 32 373. 6 383. 3x = 72; x = 24 374. 10 384. x - 12 = 35; x = 47 375. 4 385. 5x + 8 = 43; x = 7 376. 2 386. 3x = 24; x = 8 inches 377. 5 387. x + 7 = 23; x = 16 years 378. 7 388. 5 + 2x = 19; x = 7 miles 379. 6 389. 3 × 12 = 36 shirts 380. 6 390. x + 2x = 45; x = 15

SECTION 5: RATIOS & PROPORTIONS - ANSWERS

Bronze Level (391-430) 391. 1:2 411. 6 421. 6 392. 2:3 412. 10 422. 6 393. 2:3 413. 12 423. 4 394. 3:4 414. 14 424. 12 395. 2:3 415. 18 425. 10 396. 3:4 416. 24 426. 12 397. 4:5 417. 10 427. 9 398. 4:5 418. 30 428. 6 399. 3:4 419. 18 429. 15 400. 4:5 420. 18 430. 12

401. 2:3

402. 2:3

403. 2:5

404. 3:7

405. 2:3

406. 2:3

407. 1:2

408. 2:3

409. 2:3

410. 5:7

Silver Level (431-470) 431. 6 451. $9 461. $8 432. 10 452. 40 462. 30 433. 16 453. $4 463. $5 434. 12 454. 50 464. 8 435. 30 455. $7.50 465. $7 436. 8 456. 30 466. 30 437. 28 457. $3 467. $6 438. 15 458. 30 468. 60 439. 22 459. $5 469. $7 440. 18 460. 60 470. 40

441. 15

442. 16

443. 20

444. 33
445. 24

446. 39

447. 27

448. 42

449. 36

450. 15

Gold Level (471-490) 471. 100 miles 481. 60 pieces 472. 5 cups 482. 14 cups 473. $6.40 483. 24, 32, 40 474. 270 miles 484. 40°, 60°, 80° 475. 3.6 inches 485. 60, 36, 24 476. 7.5 days 486. $250 477. 9 boys 487. 18, 24, 30 inches 478. 360 items 488. 15 pounds 479. 49 blue 489. $20k, $25k, $30k 480. 15 feet 490. 6, 9, 15 gallons

SECTION 6: MIXED PRACTICE - ANSWERS

491. $52 496. 9.8

492. 7°F 497. 16

493. 140 miles 498. $36

494. x = 6 499. x = 20

495. 25% 500. 6.5

PROGRESS TRACKER

Your Achievement Badges

DECIMALS �� Bronze (1-40): __/40 = ___% ** Silver (41-80): __/40 = ___% ** Gold (81-100): __/20 = ___%

PERCENTAGES �� Bronze (101-140): __/40 = ___% ** Silver (141-180): __/40 = ___% ** Gold (181- 200): __/20 = ___%

INTEGERS �� Bronze (201-240): __/40 = ___% ** Silver (241-280): __/40 = ___% ** Gold (281-300): __/20 = ___%

EQUATIONS �� Bronze (301-340): __/40 = ___% ** Silver (341-370): __/30 = ___% ** Gold (371-390): __/20 = ___%

RATIOS ◆◆ Bronze (391-430): __/40 = ___% ◆◆ Silver (431-470): __/40 = ___% ◆◆ Gold (471-490): __/20 = ___%

MIXED PRACTICE Problems 491-500: __/10 = ___%

Overall Mastery

Total: __/500 = ___%
Level:

90-100%: ◆◆ PLATINUM

80-89%: ◆◆ GOLD

70-79%: ◆◆ SILVER

60-69%: ◆◆ BRONZE

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