

Solutions

By

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1. The Rule of 72 states that the estimate for doubling time =  $\frac{72}{APR}$

- A)  $\frac{72}{APR}$
- B)  $\frac{APR}{72}$
- C)  $\frac{APY}{APY}$
- D)  $\frac{72}{APR}$

2. Unlike APR, APY tells us the actual percentage growth per year.

- A) True
- B) False

3. Assume a six-month CD purchased for \$5000 pays simple interest at an annual rate of 9.5%. How much interest does it earn?

$$I = Prt = 5000(0.095) \left( \frac{6 \text{ months}}{12 \text{ months}} \times \frac{1 \text{ year}}{12 \text{ months}} \right) = \$237.50$$

4. Assume a 30-month CD purchased for \$2500 pays simple interest at an annual rate of 6%. What is the balance at maturity?

$$A = P(1 + rt) = \$2500 \left( 1 + 0.06 \times \frac{30 \text{ months}}{12 \text{ months}} \right) = \$2875$$

5. Suppose you invest \$5000 in a savings account that pays an APR of 4%. If the interest is compounded monthly, what is the balance in the account after 10 years?

$$A = P(1 + r)^t = 5000 \left( 1 + \frac{0.04}{12} \right)^{(10 \times 12)} = 5000 \left( 1 + \frac{0.04}{12} \right)^{120} = \$7454.16$$

6. At age 25, you start work for a company that deposits \$10,000 into a retirement account that pays a monthly interest rate of 1.1%, and interest is compounded monthly. If you retire at 65, what is the balance in this account?

65 - 25 = 40 years

$$A = P(1 + APR)^t = 10000 \left( 1 + \frac{0.011}{12} \right)^{(40 \times 12)} = \$1,907,895.94$$

7. What is the future value of a 5-year investment of \$3000 at an APR of 7% compounded monthly?

$$A = P(1 + r)^t = 3000 \left( 1 + \frac{0.07}{12} \right)^{12 \times 5} = \$4252.88$$

8. What is the present value of an investment that will be worth \$5000 at the end of ten years assuming an APR of 8% compounded monthly?

$$5000 = P \left( 1 + \frac{0.08}{12} \right)^{(10 \times 12)} \Rightarrow P = \frac{5000}{\left( 1 + \frac{0.08}{12} \right)^{120}} = \$2252.62$$

9. The going rate for a home mortgage with a term of 30 years is 6%. The lending agency says that based on your income, your monthly payment can be at most \$900. How much can you borrow?

$$\text{Amount Borrowed} = \frac{\text{Monthly Payment} \times ((1+r)^t - 1)}{(r \times (1+r)^t)} = \frac{900 \left( \left(1 + \frac{0.06}{12}\right)^{30 \times 12} - 1 \right)}{\left(\frac{0.06}{12} \left(1 + \frac{0.06}{12}\right)^{360}\right)} = \boxed{\$150,112.45}$$

10. A car dealer offers you a loan with no interest charged for the term of three years. If you need to borrow \$15,000, what will your monthly payment be?

$$\text{Three years} \times \frac{12 \text{ months}}{\text{year}} = 36 \text{ months} \Rightarrow \text{Payment} = \frac{15000}{36} = \boxed{\$416.67}$$

11. Suppose you buy a two-year \$7500 CD at an APR of 6.75% compounded monthly. How much interest will you be paid by the end of the period?

$$A = P(1+r)^t \Rightarrow A = 7500 \left(1 + \frac{0.0675}{12}\right)^{(2 \times 12)} = \boxed{\$8580.78}$$

$$\begin{array}{r} \text{Interest} = 8580.78 \\ - 7500.00 \\ \hline \boxed{\$1080.78} \end{array}$$

12. Find the interest paid on a 30-year mortgage of \$350,000 at an APR of 6%.

$$\text{Monthly payment} = \frac{350000 \left(\frac{0.06}{12}\right) \left(1 + \frac{0.06}{12}\right)^{360}}{\left(\left(1 + \frac{0.06}{12}\right)^{360} - 1\right)} = 2098.43$$

$$\begin{array}{r} \text{Interest} = 2098.43 \times 360 - 350000 \\ \hline \boxed{\$405434.80} \end{array}$$

13. Suppose you want to borrow a principal of \$450,000 for a term of 25 years at an APR of 5.5%. Then the monthly payment would be at least:

$$\text{Monthly payment} = \frac{450000 \left(\frac{0.055}{12}\right) \left(1 + \frac{0.055}{12}\right)^{(25 \times 12)}}{\left(\left(1 + \frac{0.055}{12}\right)^{300} - 1\right)} = \boxed{\$2763.39}$$

14. You want to save \$30,000 for a down payment on a home by making regular monthly deposits over four years. If the APR is 7%, how much money do you need to deposit each month?

$$\text{Need Deposit} = \frac{\text{Goal} \times r}{(1+r)^t - 1} = \frac{30000 \times \frac{0.07}{12}}{\left(1 + \frac{0.07}{12}\right)^{(4 \times 12)} - 1} = \boxed{\$543.39}$$

15. You want to save money to buy a new computer system. If you deposit \$100 a month for a year at an APR of 6% compounded monthly, how much money will you have saved after a year?

$$\text{Balance after } t \text{ deposits} = \frac{\text{Deposit} \times ((1+r)^t - 1)}{r} = \frac{100 \times \left(\left(1 + \frac{0.06}{12}\right)^{12} - 1\right)}{\left(\frac{0.06}{12}\right)} = \boxed{\$1233.56}$$

16. You have a savings account into which you invest \$75 at the end of every month and the account pays you an APR of 7% compounded monthly. Use the regular deposits balance formula to determine the balance in the account at the end of 6 months.

$$\text{Balance after } t \text{ deposits} = \frac{\text{Deposit} \times ((1+r)^t - 1)}{r} = \frac{75 \times \left(\left(1 + \frac{0.07}{12}\right)^6 - 1\right)}{\left(\frac{0.07}{12}\right)} = \boxed{\$456.61}$$



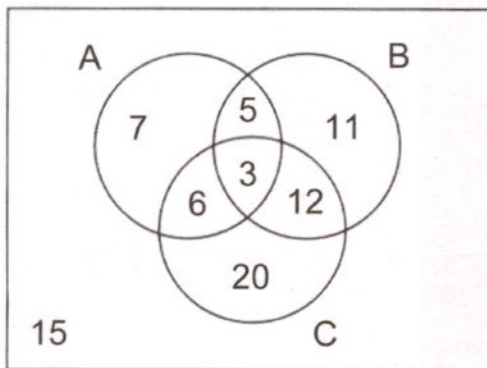
$$\text{Balance After } t \text{ deposits} = \frac{\text{Deposit} \times ((1+r)^t - 1)}{r} \Rightarrow$$

17. You have a savings account into which you invest \$100 at the end of every month and the account pays you an APR of 6% compounded monthly. Use the regular deposits balance formula to determine the balance in the account at the end of 3 years.  $\Rightarrow 3 \times 12 = 36$

$$\text{Balance after } t \text{ deposits} = \frac{100 \left( \left( 1 + \frac{0.06}{12} \right)^{36} - 1 \right)}{\left( \frac{0.06}{12} \right)} = \boxed{\$3933.61}$$

18. Two sets are called DISTJOINT if they have no elements in common.
- A) subsets
  - B) unequal
  - C) disjoint
  - D) equivalent

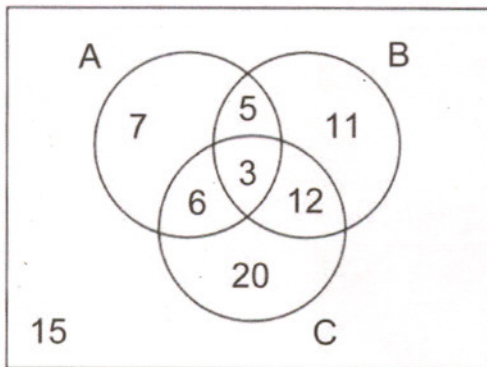
19. A group of students were surveyed to see how many of them used product A, product B, or product C. Below is a Venn diagram showing the results of the survey:



How many students surveyed used all three products?

3

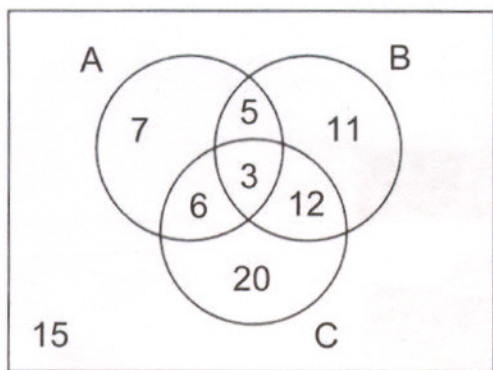
20. A group of students were surveyed to see how many of them used product A, product B, or product C. Below is a Venn diagram showing the results of the survey:



How many students surveyed use only product C?

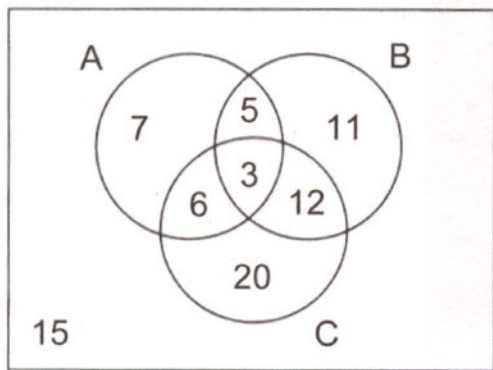
20

21. A group of students were surveyed to see how many of them used product A, product B, or product C. Below is a Venn diagram showing the results of the survey:



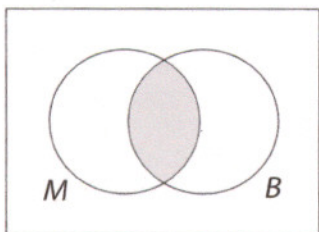
How many students surveyed did not use product A?  $= 11 + 12 + 20 + 15$   
 $= 58$

22. A group of students were surveyed to see how many of them used product A, product B, or product C. Below is a Venn diagram showing the results of the survey:



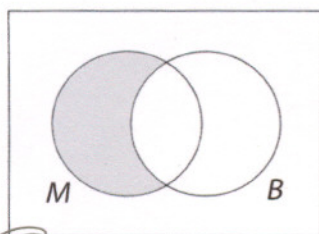
How many students were surveyed?  $15 + 20 + 12 + 3 + 6 + 11 + 5 + 7 = 79$

23. Suppose set  $M$  is mathematics majors and set  $B$  is business majors at a certain university. Then the shaded region in the following Venn diagram represents:

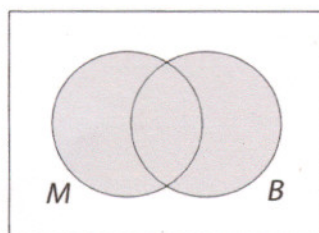


- A) Students majoring in mathematics but not in business  
 B) Students majoring in business but not mathematics  
 C) Students majoring in mathematics or in business  
 D) Students majoring in mathematics and in business

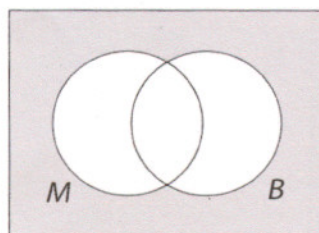
24. Suppose set  $M$  is mathematics majors and set  $B$  is business majors at a certain university. Then the shaded region in the following Venn diagram represents:



- A) Students majoring in mathematics but not in business  
B) Students majoring in business but not mathematics  
C) Students majoring in mathematics or in business  
D) Students majoring in mathematics and in business
25. Suppose set  $M$  is mathematics majors and set  $B$  is business majors at a certain university. Then the shaded region in the following Venn diagram represents:



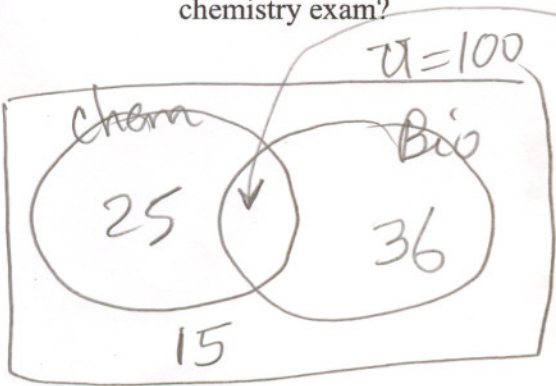
- A) Students majoring in mathematics but not in business  
B) Students majoring in business but not mathematics  
C) Students majoring in mathematics or in business  
D) Students majoring in mathematics and in business
26. Suppose set  $M$  is mathematics majors and set  $B$  is business majors at a certain university. Then the shaded region in the following Venn diagram represents:



- A) Students not majoring in mathematics  
B) Students not majoring in business  
C) Students not majoring in mathematics or in business  
D) Students not majoring in mathematics and in business



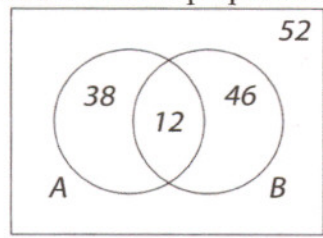
27. Suppose that 100 students were given a biology exam and a chemistry exam. Assume that 36 passed the biology exam but not the chemistry exam, 25 passed the chemistry exam but not the biology exam, and 15 passed neither exam. How many passed the chemistry exam?



$$100 - 36 - 15 - 25 = 24$$

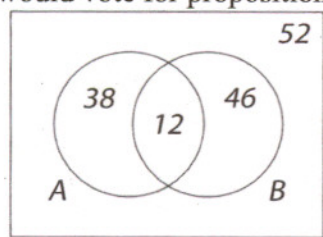
Passed Chem Exam =  $25 + 24 = 49$

28. The Venn diagram below shows the results of a survey asking registered voters if they would vote for proposition A or proposition B:



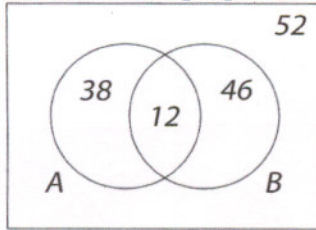
How many surveyed would vote for proposition A? =  $38 + 12 = 50$

29. The Venn diagram below shows the results of a survey asking registered voters if they would vote for proposition A or proposition B:



How many surveyed would vote for only proposition B?  $46$

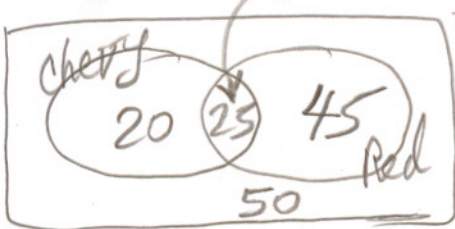
30. The Venn diagram below shows the results of a survey asking registered voters if they would vote for proposition A or proposition B:



How many surveyed would not vote for proposition A?

$$46 + 52 = 98$$

31. Suppose that 140 cars were sorted by model and color. Assume that 20 were Chevrolets but not red, 45 were red but not Chevrolets, and 50 were neither red nor Chevrolets. Make a Venn diagram using Chevrolets and red cars, and include the numbers in each region of the diagram. How many red cars were observed?



$$n = 140$$

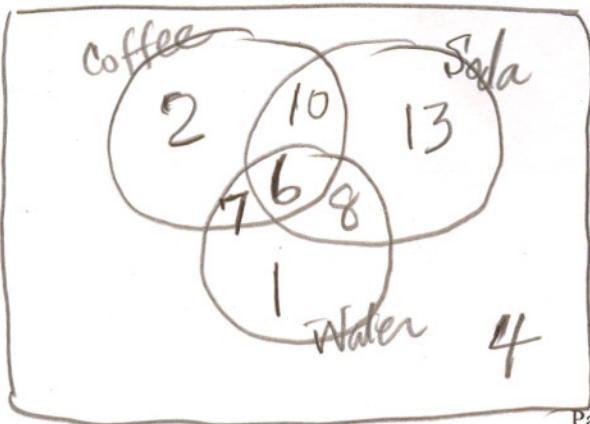
$$140 - 20 - 45 - 50 = 25$$

$$\# \text{ Red Car} = 25 + 45 = 70$$

32. A survey was conducted asking students how many drank coffee, soda, or water. The results are given in the table below:

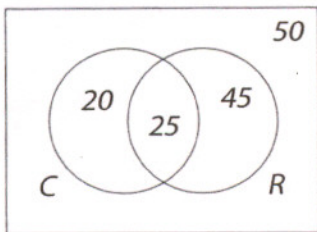
Coffee	25	✓
Soda	37	✓
Water	22	✓
Coffee and soda	16	✓
Coffee and water	13	✓
Soda and water, but not coffee	8	✓
All three	6	✓
None of these	4	✓

Use  $C$  for coffee,  $S$  for soda, and  $W$  for water and make a Venn diagram. The completed diagram should show the number in each region.



### Answer Key

1. A
2. A
3. \$237.50
4. \$2875
5. \$7454.16
6. \$1,907,895.94
7. \$4252.88
8. \$2252.62
9. \$150,112.45
10. \$416.67
11. \$1080.78
12. \$405,434.80
13. \$2062.50
14. \$543.39
15. \$1233.56
16. \$456.61
17. \$3933.61
18. C
19. 3
20. 20
21. 58
22. 79
23. D
24. A
25. C
26. C
27. 49
28. 50
29. 46
30. 98
- 31.



How many red cars? 70

32.

