



Applied Arithmetic: Mean (Average)

What many people refer to as "average" is often called "mean" on the ISEE. We use this concept of "mean" every day, for things like figuring out your grade in a class. It's basically a way to get a summary of a lot of different numbers.

Let's say you got the following test scores in your math class:

76
82
88
92

To find the average or mean of these scores (which would tell you your final grade in the class), you first need to find the total of the scores.

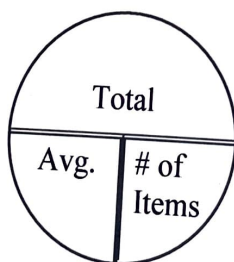
The total of the scores is 338.

Now divide the total by the number of scores you received. There were four scores, so divide the total by four.

The result is 84.5. This is the average or mean of the scores.

The equation to solve a mean or Average question is: $\text{Average} = \frac{\text{Total}}{\text{Number of items}}$

One great way to organize the numbers in an average problem is to use the "Average T."



Tip: Any time you are given two pieces of the T on a Mean/Average question, you should automatically calculate the third piece.

Practice Questions

17. Four area shelters have the following number of pets available for adoption: 19, 25, 30, and 34. What is the mean number of pets available for adoption at the four shelters?
- (A) 22
(B) 25
(C) 27
(D) 27.5
18. A troop of scouts sold an average of 56 bars of candy each during their annual fund drive. If the scouts sold a total of 1,904 candy bars, how many scouts are in the troop?
- (A) 18
(B) 22
(C) 29
(D) 34
19. If the mean of five numbers is 12, and the mean of two of these numbers is 15, what is the mean of the remaining three numbers?
- (A) 7
(B) 8
(C) 10
(D) 12
20. A set of 6 numbers has a mean of 10. What additional number must be included in this set to create a new set with a mean that is 2 less than the mean of the original set?
- (A) -8
(B) -4
(C) 2
(D) 8

Tip: Harder mean/average questions may involve several steps, and you may have to make more than one Average T.

Ratios

A ratio is a way of comparing two numbers.

"The ratio of x to y " can be written as $x : y$ or $\frac{x}{y}$.

- 7 to 2 is not the same as 2 to 7.
- Ratios compare like quantities.
- Ratios should be in the most reduced form.

A classroom contains 20 boys and 15 girls. What is the ratio of:

- boys to girls? ~~4:3~~ : 15
- girls to boys? ~~3:4~~ : 20
- boys to total number of children? ~~4:7~~ : 35
- girls to total number of children? ~~3:7~~ : 35

Sometimes you're given the ratio, and you need to find the number.

If the ratio of owls to eagles is 4 : 5, and there are 12 owls.

- How many eagles are there? 15
- How many birds are there? 27

Tip: When working with ratios, it can often be helpful to make a "ratio table" like the one below.

	Owls	Eagles	Total birds
(ratio numbers)	4	5	999 989
(multiplier) ×	00 00	00 00	
(actual numbers)	12	00 15	999 00

Practice Questions

21. In a certain parking lot, there are 24 cars and 15 trucks. If there are no other vehicles in the lot, what is the ratio of cars to trucks in the lot?
- (A) 8 : 5
(B) 8 : 13
(C) 5 : 8
(D) 5 : 13
22. If the ratio of sixth graders to seventh graders is 6 : 5, then which of the following could be the number of sixth graders?
- (A) 25
(B) 28
(C) 33
(D) 36
23. If a jar contains 14 red marbles and 9 blue marbles, what will be the ratio of blue marbles to red marbles after one third of the blue marbles are removed?
- (A) 14 : 9
(B) 7 : 3
(C) 3 : 7
(D) 3 : 10
24. A jewelry designer needs to cut a length of wire into two pieces that form a ratio of 4:5. If the length of wire is 72 inches long, how long, in inches, will the smaller piece be?
- (A) 9
(B) 32
(C) 36
(D) 40



Rates

A rate is a sort of ratio. The word "per" is a giveaway: It means you're dealing with a rate.

Rates can be expressed as fractions. Put one thing on top of the other:

$\frac{\text{distance}}{\text{time}}$

$\frac{\text{cost}}{\text{mile}}$

To solve a rates question, set up two fractions and make them equal to each other.

- Either unit can go on top of the fraction, but make sure you are consistent about which unit goes on top and which unit goes on bottom.
- On one side, put the fraction with information you know.
- On the other side, put the fraction with information you're looking for.

Example:

If Angel buys 5 apples for 40 cents, how many apples can she buy for \$1.20?

$$\frac{5}{40} = \frac{x}{120} = 25$$

Now solve for x .

Practice Questions

25. At a stationery store, ball-point pens cost \$2.75 for a box of 12. How much will Elmer need to spend if he wants to buy 60 ball-point pens?
- (A) \$13.75
(B) \$33.00
(C) \$165.00
(D) \$720.00
26. The pastry chefs at Betty's Bakery bake 25 apple pies every two hours. If they maintain this constant rate over the course of a 10-hour workday, how many apple pies will they bake?
- (A) 50
(B) 100
(C) 125
(D) 250

27. Kelly drove 120 miles in 90 minutes. If Kelly maintained a constant speed, how many minutes did it take her to drive 80 miles?

- (A) 44.3
- ☒ (B) 50
- (C) 60
- (D) 106.7

28. If it took Audrey 3 hours working at a constant rate to complete her book report, what part of the report was finished during the first 30 minutes?

- ☒ (A) $\frac{1}{6}$
- (B) $\frac{1}{4}$
- (C) $\frac{1}{3}$
- (D) $\frac{1}{2}$

Tip: Before you start writing fractions, what do you have to do with the time units in this problem?

29. On a map, 5 cm equals 60 miles. If two cities are 12 centimeters apart on the map, what is their actual distance apart?

- (A) 25 miles
- (B) 100 miles
- (C) 120 miles
- ☒ (D) 144 miles

Tip: The above problem is actually called a “proportion” problem, but it’s handled just like a rate problem—that is, by keeping the units straight, setting up two fractions, making them equal to each other, and then solving for the unknown value.

Percent Word Problems

Many word problems on the ISEE involve percents. A percent word problem may require you to apply the percent formula.

The percent formula states: $\frac{\text{Part}}{\text{Whole}} = \frac{n}{100}$, where n is the percent you are looking for.

Example: Olivia got 8 out of 10 questions right. What percent did Olivia get right? _____

You may also have to translate English into math on a percent word problem. For that, the following table may be of help.

English	Math
What	x (or any variable)
Percent, %	$\frac{\quad}{100}$ (over 100)
Of	$\times$ (times)
Is, are	$=$

Practice Questions

30. There are 300 apples in a barrel, and 60 of these apples are bruised. What percent of the apples are bruised?

- (A) 20%
- (B) 30%
- (C) 40%
- (D) 60%

31. What percent of 4 is 5?

- (A) 20%
- (B) 80%
- (C) 120%
- (D) 125%

SUMMARY DIRECTIONS: For the following questions, answer

- A if the quantity in Column A is greater
- B if the quantity in Column B is greater
- C if the two quantities are equal
- D if the relationship cannot be determined from the information given

	Column A		Column B
32.	60% of 75	B	75% of 60

Percent Change

Sometimes a question may ask for the percent increase or decrease in the price of an item, population of a city, or whatever. We have already seen one way to handle a "percent change" problem when no number is provided for the original amount—that is to plug in 100 for the amount. However, it may be helpful to know a few other formulas and techniques for handling percent change problems. So here they are.

The Percent Change formula states: $\text{Percent Change} = \frac{\text{Difference}}{\text{Old Amount}} \times 100\%$,

where "Difference" is the difference between the two amounts and "Old Amount" is the amount before the increase or decrease.

Also, here is one fast way to find out a new amount after the old amount has been increased or decreased by a certain percent:

- Convert the percent into a decimal.
- For percent increase, add that decimal to 1; for percent decrease, subtract that decimal from 1.
- Multiply that result by the old amount.

3. A pair of jeans that was originally priced at \$77.99 was marked down on sale to a price of \$63.99. The sale price is approximately what percent less than the original price?

- (A) 14%
- (B) 18%
- (C) 25%
- (D) 82%

4. Pets-R-Us pet store posted a 150 percent increase in the number of beagle puppies sold in 2008 over the previous year. If the store sold 52 beagle puppies in 2007, how many did it sell in 2008?

- (A) 78
- (B) 130
- (C) 156
- (D) 202