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Percentages (%) - Worksheet

Percentages are used to compare parts of an original. A percentage is expressed by a number followed by a percentage (%) sign and illustrates the portion considering '100' as the whole.

Example

20% means 20 parts of 100.

Hence, in the case of 20% discount on a price; if the price is $100, you'd pay $20 less. But if the price is $500, which is (5*$100), you'd pay (5*20) = $100 less.

If the price is $750 (that is 7.5*100)' you would pay $150 (7.5*20 = 150) less from the price.

Methods of calculation

As explained above, percentage is the number illustrating parts of 100. Hence, we can write the percentage as a fraction with 100 as the denominator.

e.g. 40% = 40/100

So, if we need to calculate 40% of 500, we can model it like below,

$$\frac{40}{100} \times \frac{500}{1} = 200$$

Example

Calculate 35% of 250.

$$\frac{35}{100} \times \frac{250}{1} = 87.5$$

Note: even if the percentage is a whole number, the calculated amount can be a decimal depending on the original number.

Calculating 'how much is the new amount'?

Imagine you are buying a shirt at 25% discount which is originally priced at $150. How much would you pay after the discount?

These type of questions require an added step in the calculation where you find out 'how much is left' from the original amount after the discount.

Example

As in this situation,

Discount amount:

$$\frac{25}{100} \times \frac{150}{1} = 37.5$$

So you would get $37.5 discount on the shirt. But the question is how much would you pay. To calculate the discounted price, you need to take away the discount amount from the original price:

$150-$37.5 = $112.5

Example

Your cousin has 45 cards. You gave 12.5% more to him as a gift. How many cards has he got now?

Total number of cards= 45

12.5% more were gifted, that is,

$$\frac{12.5}{100} \times \frac{45}{1} = 5$$

So, 5 cards more were given. Hence, currently he has:

45 + 5 = 50 cards.

Calculating 'how much was the original amount'?

You might also be asked to calculate the original amount from the new amount, given the percentage.

Example

You bought a novel for $25 after a 20% sale. What was the book's original price?

So, essentially, the price you bought the book for is the discounted price. We know,

Discounted amount= Original amount- Discount

If we consider, original price as x, with all the given information we get,

25= x – 20% of x

We can write 20% as 20/100

$$25 = x - \frac{20}{100}\, x$$

Which is same as, $x - \frac{20}{100} x = 25$

If we solve the equation, we get,

$$\frac{100x - 20x}{100} = 25$$

$$\frac{80x}{100} = 25$$

$$80x = 2500$$

$$x = 31.25$$

So the original price was $31.25

One step method: converting to decimal

As we already know, a percentage can be written in a fraction form with 100 in the denominator. The next step would be converting that fraction to decimal. We already know the method to convert fractions to decimal. Please refer to the **Fraction** chapter for a refresher.

Example

$$20\% = \frac{20}{100} = \frac{1}{5} = 0.2$$

So if we want to calculate 20% of 200,

$$\frac{20}{100} \times \frac{200}{1} = 0.2 \times 200 = 40$$

Another way: put the decimal point after two places from the right.

So, 20% = 0.20

15% = 0.15

7% = 0.07 (note: if the percentage is one digit, you put zero on the left to make it two places after the decimal point)

Example

Scenario 1: 25% discount on a price of $300. Calculate the new price.

Here, the new amount would be less than the original.

Step 1: take away 25% from 100%, which gives us 75%

Step 2: Convert the percentage into decimal. 75% = 0.75

Step 3: multiply the decimal with the original amount to calculate the new amount,

($300 * 0.75) = $225

So the discounted price is $225

Scenario 2: 6% raise on salary originally $20/hr.

Here, the new amount would be higher than the original.

Step 1: add 6% to 100%, which gives us 106%

Step 2: Convert the percentage into decimal. 106% = 1.06

Step 3: multiply the decimal with the original amount to calculate the new amount:

($20 * 1.06) = $ 21.2

So the new salary is $21.2/hr.

The example problem in '**Calculating - how much was the original amount?'** section could be solved in a simpler way if we convert the percentage in to decimal point. Here we want to calculate the original amount.

Example

Scenario 1: 20% discount gives you a discounted price of $25

Here, the original amount would be more than the new amount.

Step1: take out 20% to 100%, which gives us 80%

Step 2: Convert the percentage into decimal. 80% = 0.8

Step 3: divide the new amount by the decimal to calculate the original amount

($25 ÷ 0.8) = $31.25

So the original price is $31.25

Scenario 2: 6% raise on salary gives you $21.2/hr

Here, the original amount would be less than the new salary.

Step1: add 6% to 100%, which gives us 106%

Step 2: Convert the percentage into decimal. 106% = 1.06

Step 3: divide the decimal with the new amount to calculate the original amount,

($21.2 ÷ 1.06) = $ 20

So the new salary is $20/hr.

Calculating 'the percentage'?

To calculate the percentage, we need information about the original and the new amount.

Example

A toy originally priced for $10 is sold on special for $7. What is the discount rate?

Step 1 is to calculate the change between the new and the original amount. Here the discount amount can be calculated by taking out the new price from the original price. Discount amount = $10-$7 = $3

As we know, percentage is the portion of 100, we need to calculate the discount amount for 100.

Discount percentage= $\frac{3}{10} \times \frac{100}{1} = 30\%$

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Practice Exercises

Question 1

Calculate the portion of the original number depending on the given percentages:

No.	Original number	Percentage	Answer
1	935	10%	
2	200	2.5%	
3	75	40%	
4	732	35%	
5	340	27%	

Question 2

Change the following percentages into decimal points,

No.	Percentage	Decimal
1	93%	
2	2%	
3	115%	
4	27%	
5	2.5%	

Question 3

There is a 30% sale going on in a branded store on shoes. If you choose a pair originally priced $250, how much is the discount on the pair?

Question 4

For the new financial year, an employee has received a 2.5% pay rise. If the previous rate was $23.97 per hour, what is her new rate?

Question 5

A student scored 42 out of 50 in the first math test and scored 48 out of 50 on the second. By what percentage has the student's result improved?

Question 6

You are looking for a new house for rent and the rates have increased by 20%. You are about to rent one for $320/week. How much was the earlier rent for the house?

Answers

Answer 1:

Calculate the portion of the original number depending on the given percentages:

No.	Original number	Percentage	Answer
1	935	10%	93.5
2	200	2.5%	5
3	75	40%	30
4	732	35%	256.2
5	340	27%	91.8

Answer 2:

Change the following percentages into decimal points,

No.	Percentage	Decimal
1	93%	0.93
2	2%	0.02
3	115%	1.15
4	27%	0.27
5	2.5%	0.025

Answer 3:

Original price= $250

Discount rate= 30%

Discount amount:

$$\frac{30}{100} \times \frac{250}{1} = \$75$$

Answer 4:

Previous salary= $23.97/hr

Pay rise= 2.5%

So, the increased amount:

$$\frac{2.5}{100} \times \frac{23.97}{1} = \$0.599$$

So new salary rate = $ (23.97 +0.599) = $24.60 (rounded to the nearest)

Answer 5:

Previous score = 42

New score = 48

So, score increased by (48-42) = 6

To calculate the percentage increase in this instance, we need to calculate how much it would have increased if the previous score was 100. The score has increase by 6 from 42.

$$\frac{6}{42} \times \frac{100}{1} = 0.1428 \times 100 = 14.28\%$$

So the result has improved by 14.28%.

Answer 6:

Current rate = $320/week

Rates increased by 20%

So, the current rent is the addition of the original rent with the increased amount, which means original rent would be less than the current rent.

If we add the increased percentage with 100% we get 120%

Converting 120% into decimals; 120%= 1.2

Divide the current rent/week by the decimal to get the original rent/week

$$320 \div 1.2 = 266.66$$

So the earlier rent was $267/week (rounded to the nearest dollar).