

N2-2 Fractions of Numbers

- finding fractions (common, decimal and percent) of numbers
- adding and subtracting percentages to/from numbers, including by multiplying

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Summary

To find say $\frac{1}{5}$ of a number or quantity, divide it by 5. To find say $\frac{3}{8}$ of a number, divide it by 8, then multiply the result by 3.

To find say 12% of a number, as 12% is $\frac{12}{100}$, divide by 100, then multiply by 12.

To find say 0.27 of a number, multiply it by 0.27.

An alternative way to find a common fraction or percent of a number is to convert the common fraction or percent to a decimal fraction and multiply by that.

To add or subtract say 20% to/from a number, you can find that percentage of the number and add or subtract it. But it is better to add or subtract the 20% to/from 100%, then change that percentage to a decimal, then multiply by the decimal.

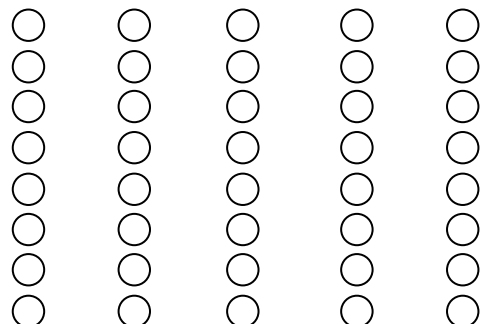
Learn

Common Fractions

A fifth of a pizza is the amount you get if you divide it into 5 equal pieces and take one of them.

In the same way, we can talk about a fifth of an amount of money, e.g. $\frac{1}{5}$ of \$40, or a fifth of a mass e.g. $\frac{1}{5}$ of 100 kg, in fact a fifth of any number, e.g. $\frac{1}{5}$ of 60.

A fifth of \$40 is what you get if you divide \$40 into 5 equal amounts and take one of them. The 40 one-dollar coins to the right have been divided into 5 equal groups. Each group is one fifth of the \$40. As we can see, one fifth of \$40 is \$8.



This can be worked out by drawing the coins, but it takes a while. It is easy to work out another

way, though. Because we are dividing the \$40 into 5 equal parts, we just divide \$40 by 5 and we get \$8. So, $\frac{1}{5}$ of \$40 = $\$40 \div 5 = \8 .

In the same way, $\frac{1}{5}$ of \$100 kg is $100 \text{ kg} \div 5$, which is 20 kg, and $\frac{1}{5}$ of 60 is $60 \div 5$, which is 12.

We can work out an eighth of a number by dividing by 8 and so on. So, $\frac{1}{8}$ of \$40 is $\$40 \div 8$ which is \$5, $\frac{1}{8}$ of 24 is $24 \div 8 = 3$.

Likewise with other fractions. $\frac{1}{10}$ of \$50 is $\$50 \div 10$, which is \$5, $\frac{1}{4}$ of 20 km is 5 km, $\frac{1}{4}$ of \$6 is \$1.50, $\frac{1}{2}$ of 25 mins is 12.5 mins and so on.

Now, if $\frac{1}{5}$ of \$40 is \$8, this means that, if we divide \$40 into fifths, each fifth will be \$8. If you take 2 of those fifths, you will have 2 lots of \$8, which is \$16.

So, 2 fifths of \$40 is $\$40 \div 5 \times 2 = \16 : $\frac{2}{5}$ of \$40 is \$16.

$\frac{3}{5}$ of \$40 will be $\$40 \div 5 \times 3 = \24 .

$\frac{4}{5}$ of \$40 = $\$40 \div 5 \times 4 = \32 . $\frac{5}{5}$ of \$40 = $\$40 \div 5 \times 5 = \40 .



So, to find say $\frac{3}{5}$ of an amount, divide it by 5 to get $\frac{1}{5}$, then multiply by 3 to get $\frac{3}{5}$.

To find $\frac{7}{10}$ of 60 m, divide 60 by 10 to get $\frac{1}{10}$ (this is 6), then multiply by 7 to get $\frac{7}{10}$ (this is 42). You can use this method to find any common fraction of any number.

Practice

Q1 Copy and complete the following table.

	20	400	\$6.00	\$360
$\frac{1}{4}$ of				
$\frac{1}{5}$ of				
$\frac{3}{5}$ of				
$\frac{7}{10}$ of				
$\frac{5}{8}$ of				

Percents

To find 5% of \$400, just think of this as $\frac{5}{100}$ of \$400. $\frac{1}{100}$ of \$400 is $\$400 \div 100$ which is \$4, and $\frac{5}{100}$ of \$400 is $\$4 \times 5$ which is \$20. This will work for all percentages.

A useful shortcut to finding percents can be to remember that 10% is $\frac{1}{10}$. So to find 30% of \$60, just find $\frac{3}{10}$ instead of $\frac{30}{100}$.

Practice

Q2 Copy and complete the following table.

	\$1000	400 kg	6 t	25
1% of				
2% of				
12% of				
30% of				
120% of				

Decimal fractions

To find 0.42 of 6000, just think of 0.42 as $\frac{42}{100}$. $\frac{1}{100}$ of 6000 is $6000 \div 100 = 60$. $\frac{42}{100}$ of 6000 is $60 \times 42 = 2520$. This will work for all decimals.

These calculations can be hard in your head. A calculator will make it easier. But then, if you have a calculator, you can do it more quickly by multiplying 6000 by 0.42. With fractions, 'of' always means 'multiplied by', so 0.42 of 6000 means 0.42×6000 or 6000×0.42 .

Practice

Q3 Copy and complete the following table. Use a calculator for the harder ones.

	100	30 h	\$6.00	125 g
0.1 of				
0.4 of				
0.05 of				
1.1 of				
2.42 of				

Alternative Method for Common Fractions and Percents of

An alternative for finding common fractions or percents of numbers is to convert the common fraction or percent to a decimal fraction and then multiply by the decimal fraction. This can be useful if you have a calculator.

For example, to find $\frac{3}{8}$ of \$720, convert $\frac{3}{8}$ to 0.375 (just divide 3 by 8), then multiply 720 by 0.375 to get 27. To find 17.5% of \$245, convert 17.5% to 0.175 (just move the decimal point two places to the left), then do 245×0.175 to get \$42.875.

Although you can use any valid method for these calculations, this alternative method of converting to a decimal and multiplying is probably the best one, especially as it leads naturally into the best technique for adding or subtracting a percentage to/from an amount, which we will meet next.

Practice

Q4 Use the alternative method above for these.

	20	60 kg	15.5	425 s
$\frac{5}{8}$ of				
$\frac{7}{12}$ of				
23% of				
4% of				
31.28% of				

Adding and subtracting percentages to/from numbers

Sometimes a price is reduced by 30% or raised (increased) by 20%. To work out the new price, you can calculate the required percentage of the original price, then add or subtract that percentage to/from the original price. For example, suppose that, in a sale, a \$60 pair of jeans was reduced 40%. To find the new price, work out 40% of \$60, which is \$24. Then subtract the \$24 discount from the original \$60 to get \$36.

Practice

Q5 Copy and complete the following table.

	\$80	\$400	\$5.00	30 kg
Add 20% to				
Reduce by 40%				

The Multiplication Method

There is a better way to add and subtract a % to/from an amount. It takes a bit more to understand, but it is a bit quicker. It's main benefit, though, is that it allows us to do other calculations like working out the price before a discount if we know the discount and working out compound interest. We will do both of these in later modules. Because of this, it is important that you master this method.

Suppose we want to take 10% off the price of an \$80 dress. We realise that we will only pay 90% of the full price. [Normally we would pay 100% of the price, but if we reduce it by 10%, we will only pay 90%: we just take the 10% off 100% and get 90%.] Then we realise that 90% is 0.9, so we find $0.9 \times \$80$, which is \$72.

If we wanted to give a 25% discount on a \$35 haircut, we realise that we charge 75% of the normal price ($100\% - 25\%$). 75% is 0.75. $0.75 \times \$35$ is \$26.25.

Likewise, if we wanted to add a 10% surcharge to the price of a \$40 meal, we charge 110% of the price ($100\% + 10\%$). 110% is 1.1. $1.1 \times \$40$ is \$44.

Practice

Q6 Copy and complete the following table using the multiplication method.

	\$50	\$200	\$10.00	60 cm
Reduce by 10%				
Take 20% off				
Add 10% to				
Increase by 50%				
Reduce by 60%				
Add 150% to				

Q7 Use the multiplication method for these:

- Add 10% to \$40
- Subtract 10% from \$40
- Find the cost of a \$60 jacket after it is reduced 30%
- A restaurant adds an 8% surcharge to a \$70 bill. How much will it come to?
- Albert bought a rare coin for \$120 and it increased in value by 150%. How much was it worth then?
- Marcia bought a \$2400 necklace, but got a 6% discount for paying cash. How much did she pay?

Solve

- Q51 Tommo the greengrocer bought a cabbage for \$2. He then put it on sale for 40% more than he bought it for (a 40% mark-up). It didn't sell, so he reduced the price by 40%. How much was it on sale for then? [Careful – the answer is not \$2 – find the price he put it on sale for, then take 40% off that.]
- Q52 A seal pup was 6 kg when born. Each day its weight increased by 10%. How much did it weigh 5 days after it was born? [Hint: use the multiplication method and just multiply by 1.1 five times.]
- Q53 How much would the seal in the last question weigh 40 days after it was born? [Hint: the power button on your calculator might be helpful.]
- Q54 If the price of a \$120 pair of shoes is reduced by 150%, what will they cost?

Revise

Revision Set 1

- Q61 Find (a) $\frac{3}{8}$ of \$48 (b) 0.3 of 50 (c) 120% of \$200
- Q62 Add 30% to \$60
- Q63 Find the cost of a \$90 fish after it is reduced 20%
- Q64 Albert bought a cat for \$4 000 and it increased in value by 220%. How much was it worth then?
- Q65 Marcia bought a \$600 necklace, but got a 9% discount for paying cash. How much did she pay?

Answers

Q1

	20	400	\$6.00	\$360
$\frac{1}{4}$ of	5	100	\$1.50	\$90
$\frac{1}{5}$ of	4	80	\$1.20	\$72
$\frac{3}{5}$ of	12	240	\$3.60	\$216
$\frac{7}{10}$ of	14	280	\$4.20	\$252
$\frac{5}{8}$ of	12.5	250	\$3.75	\$225

Q2

	\$1000	400 kg	6 t	25
1% of	\$10	4 kg	0.06 t	0.25
2% of	\$20	8 kg	0.12 t	0.5
12% of	\$120	48 kg	0.72 t	3
30% of	\$300	120 kg	1.8 t	7.5
120% of	\$1200	480 kg	7.2 t	30

Q3

	100	30 h	\$6.00	125 g
0.1 of	10	3 h	60 c	\$6.60
0.4 of	40	12 h	\$2.40	50 g
0.05 of	5	1.5 h	30 c	6.25 g
1.1 of	110	33 h	\$6.60	137.5 g
2.42 of	242	72.6 h	\$14.52	302.5 g

Q4

	20	60 kg	15.5	425 s
$\frac{5}{8}$ of	12.5	37.5	9.6875	265.625
$\frac{7}{12}$ of	11.67...	35	9.04...	249.9...
23% of	4.6	13.8	3.565	97.75
4% of	0.8	2.4	0.62	17
31.28% of	6.256	18.768	4.8484	132.94

Q5

	\$80	\$400	\$5.00	30 kg
Add 20% to	\$96	\$480	\$6.00	36 kg
Reduce by 40%	\$48	\$240	\$3.00	18 kg

Q6

	\$50	\$200	\$10.00	60 cm
Reduce by 10%	\$45	\$180	\$9.00	54 cm
Reduce by 20%	\$40	\$160	\$8.00	48 cm
Add 10% to	\$55	\$220	\$11.00	66 cm
Add 50% to	\$75	\$300	\$15.00	90 cm
Reduce by 60%	\$20	\$80	\$4.00	24 cm
Add 150% to	\$125	\$500	\$25.00	150 cm

Q7 (a) \$44 (b) \$36 (c) \$42 (d) \$75.60 (e) \$300 (f) \$2 256

Q51 \$1.68 Q52 9.66 kg Q53 271.6 kg Q54 -\$60

Q61 (a) \$18 (b) 15 (c) \$240

Q62 \$78 Q63 \$72 Q64 \$12 800 Q65 \$546