

Percentage

Sec 1 Maths printable practice pack



What this PDF is for

Use this pack after the webpage overview. Students practise percentage basics, percentage change, percentage point, reverse percentage, and real-world applications such as discount, GST, profit and loss, and commission.

Practice load: 88 questions with answers and short explanations.

Learning goals

- Express percentages as fractions and decimals, including percentages greater than 100% and less than 1%.
- Find a percentage of a quantity and compare quantities using percentages.
- Solve percentage change, percentage point and reverse percentage questions.
- Apply percentages to real-world contexts such as profit, loss, discount, GST, service charge and commission.

Concept summary

A percentage expresses a quantity as a number of parts out of 100. The symbol % means "per cent", or "per hundred".

Concept	Useful form	What to remember
Percentage as fraction and decimal	$\mathcal{X}\% = \mathcal{X} / 100$	Example: $72\% = 72/100 = 0.72$.
Convert decimal to percentage	$\text{decimal} \times 100\%$	Example: $0.35 = 35\%$.
Percentage of a quantity	$\mathcal{X}\%$ of a quantity = $(\mathcal{X}/100) \times \text{quantity}$	The word "of" usually means multiply.
One quantity as percentage of another	$(\text{part} / \text{whole}) \times 100\%$	Both quantities must use the same unit.

Important traps

- 100% means the whole original quantity.
- Percentage change uses the original value as the base.
- Percentage point and percent change are different.
- Do not add or average percentages blindly when the bases are different.

Worked examples

Worked Example A: Convert between percentage, fraction and decimal

Express 0.36 as a percentage.

$$0.36 \times 100\% = 36\%$$

Express 4.5% as a decimal.

$$4.5\% = 4.5 / 100 = 0.045$$

Worked Example B: Find a percentage of a quantity

Find 35% of \$240.

$$35\% \text{ of } \$240 = (35/100) \times 240 = \$84$$

Worked Example C: Express one quantity as a percentage of another

There are 18 boys and 12 girls in a class. Express the number of girls as a percentage of the class.

$$\text{Total students} = 18 + 12 = 30$$

$$\text{Percentage of girls} = 12/30 \times 100\% = 40\%$$

Worked Example D: Percentage change

A price increases from \$80 to \$92. Find the percentage increase.

$$\text{Increase} = 92 - 80 = 12$$

$$\text{Percentage increase} = 12/80 \times 100\% = 15\%$$

Worked examples continued

Worked Example E: Reverse percentage

After a 20% discount, a bag costs \$64. Find the original marked price.

After 20% discount, the sale price is 80% of the marked price.

$$80\% = \$64$$

$$1\% = \$64 / 80 = \$0.80$$

$$100\% = \$0.80 \times 100 = \$80$$

Worked Example F: Profit and loss

A watch is bought for \$120 and sold for \$150. Find the profit percentage.

$$\text{Profit} = \text{selling price} - \text{cost price} = 150 - 120 = 30$$

$$\text{Profit percentage} = 30/120 \times 100\% = 25\%$$

Worked Example G: GST

A printer costs \$300 before GST. If GST is 9%, find the total amount payable.

$$\text{GST} = 9\% \text{ of } \$300 = 0.09 \times 300 = \$27$$

$$\text{Total amount} = \$300 + \$27 = \$327$$

This PDF uses 9% GST for current Singapore-context examples.

Practice A - percentage, fraction and decimal

1. Express 47% as a fraction and a decimal.
2. Express 64% as a decimal.
3. Express 0.38 as a percentage.
4. Express $\frac{4}{5}$ as a percentage.
5. Express 0.007 as a percentage.
6. Express 318% as a decimal.
7. Express 0.2% as a decimal.
8. Express $49\frac{1}{3}\%$ as a mixed number percentage and decimal.
9. Express 5.468 as a percentage.
10. Express $\frac{17}{2000}$ as a percentage.
11. Find 0.8% of 4.5 m.
12. Find $11\frac{3}{5}\%$ of 24 kg.

Practice B - percentage of a quantity

13. There are 40 students. 25% wear spectacles. Find the number who wear spectacles.
14. 60% of 25 girls have long hair. Find the number of girls with long hair.
15. There are 50 cards. 18 cards are red. What percentage are red?
16. A ribbon is 30 cm long. Find 2.5% of the ribbon.
17. Find $15\frac{3}{4}\%$ of 640 kg.
18. Find 2500% of \$4.60.
19. A school has 450 boys and 750 girls. Calculate the percentage of boys in the school.
20. Find 7.5% of 1000 m.
21. A bag contains 36 red marbles out of 90 marbles. What percentage are red?
22. Find 125% of \$760.

Practice C - compare quantities by percentage

23. A has 12 years old and his sister is 20 years old. Express A's age as a percentage of his sister's age.
24. Express A's sister's age as a percentage of A's age.
25. A magazine A has 128 pages and magazine B has 200 pages. Express pages in A as a percentage of pages in B.
26. By how many percent is the number of pages in B more than the number in A?
27. School A had 600 out of 1000 students participate in a walkathon. School B had 400 out of 1000 students participate. Which school had a higher proportion?
28. Village A has 400 people and 250 attended an event. Village B has 3500 people and 3000 attended. Which village had a higher percentage attendance?
29. Yi Hao scored 18/25, 35/50 and 40/64 in three tests. Which was his best result by percentage?
30. A fruit table gives sugar content: blackberry 0.439 g out of 1.5 g, blueberry 0.149 g out of 1.5 g, raspberry 0.084 g out of 1.9 g, strawberry 0.326 g out of 7 g. Which has the lowest percentage of sugar?

Practice D - percentage change

Use original value as the base unless the question clearly says otherwise.

31. A salary increases from \$1600 to \$1680. Find the percentage increase.
32. A salary decreases from \$1600 to \$1520. Find the percentage decrease.
33. A population increases from 3.93 million to 3.97 million. Find the percentage increase to 3 significant figures.
34. Water price rises from \$2.39 to \$2.50 per cubic metre. Find the percentage increase.
35. Births fall from 42 185 to 42 000. Find the percentage decrease.
36. Wood cost \$300 and increases by 12%; paint cost \$200 and increases by 7%; wages cost \$200 and decreases by 10%. Find the total new cost.
37. The length of a rectangle increases by 10% while the breadth decreases by 10%. Find the percentage change in area.
38. The length of a rectangle decreases by 20% while the breadth increases by 20%. Find the percentage change in area.

Reminder: Percentage increase or decrease = $\text{change} / \text{original value} \times 100\%$.

Practice E - percentage point and reverse percentage

39. An article says unemployment rose from 5% to 7%. What is the increase in percentage points?
40. Explain why an increase from 5% to 7% is not a 2% increase.
41. 30% of a student council walk to school. If 48 students walk to school, find the total number of students.
42. 70% of the books on a shelf are English books. If there are 35 English books, find the total number of books.
43. After a 5% increase, Joyce's salary becomes \$2205. Find her original salary.
44. After 6% is deducted from a bill, \$282 remains to be paid. Find the original bill.
45. After a pay cut of 3%, Shufen's salary becomes \$3346.50. Find her original salary.
46. A car's value after 2 years is 45% of its original value. If the value now is \$34 300, find the original value.

Trap: In reverse percentage, first identify what percentage the final amount represents. Then find 100%.

Practice F - profit, loss and discount

47. A bag costs \$28 and is sold for \$35. Express the profit as a percentage of the cost price.
48. A bag costs \$28 and is sold for \$24.50. Express the loss as a percentage of the selling price.
49. A bicycle costs \$180 and is sold for \$240. Express the profit as a percentage of the cost price.
50. An antique chest costs \$6000 and is sold for \$5000. Express the loss as a percentage of the selling price.
51. A gold chain costs \$500 and is sold at a profit of 27% on the cost price. Find its selling price.
52. A car costs \$78 400 and is sold at a loss of 6% on cost price. Find its selling price.
53. A watch priced at \$160 is sold for \$100. Find the percentage discount.
54. The marked price of a washing machine is \$600. A discount of 6% is given. Find the sale price.
55. A laptop is sold for \$1274 after a discount of 9%. Find the marked price.
56. A sculpture is sold for \$533 after an 18% discount. Calculate the marked price.

Practice G - GST, service charge and commission

57. An article costs \$85 before GST. Assuming GST is 9%, find the total amount payable.
58. A printer is sold for \$642 inclusive of 9% GST. Find the marked price before GST.
59. A restaurant offers a 15% discount on food. There is a service charge of 10% and GST of 9%. Given a final bill of \$96.90, find the price before discount.
60. A meal costs \$120 before service charge and GST. Find the total bill if service charge is 10% and GST is 9% applied after service charge.
61. A property agent sells a house for \$320 000 and receives a commission of 1.5%. Calculate the commission.
62. A property agent sells a house for \$528 000 and receives 2% commission. Find the commission.
63. A property agent charges 3.5% on the selling price. If the commission is \$25 375, find the selling price.
64. Joyce's monthly income consists of a basic salary of \$500 and commission of 4% on sales. If she earns \$1220 for a month, find her sales.

Practice H - mixed real-world problems

65. A florist buys roses at \$18 per dozen and sells them at \$1.20 each. Express her profit as a percentage of the cost price.
66. The profit on a refrigerator is 35% of the cost price. If the profit is \$280, find the cost price.
67. By selling a book for \$16.50, Albert loses 12% on cost price. Find the cost price.
68. A necklace priced at \$580 is sold for \$464. Find the percentage discount.
69. The marked price of a folding table at a hypermarket is \$45. It becomes \$54 after 12% discount and 9% GST. Find the sale price before GST.
70. During a sale, there is a discount of 7% on a television set. If the discount is \$49, find the marked price and sale price.
71. A microwave oven costs \$270 before GST. Assuming GST is 9%, find the total amount payable.
72. An electronic gadget is sold for \$1391 inclusive of 9% GST. Find the marked price before GST.
73. A property agent charges 2.5% commission on the selling price. Given commission \$6500, find the selling price.
74. An air-conditioner is sold for \$700 after a discount of 12.5%. Find the marked price.

Challenge questions

75. A house cost 36% more today than when it was built. If it now costs \$333 000, find its original cost.

76. 45% of students in a writing competition were boys. If 135 boys took part, find the total number of students.

77. 20% of a number is 17. Find the number.

78. 175% of a number is 49. Find the number.

79. The number 2400 is first increased by 30%, then decreased by 20%. Find the final number.

80. In 2018, a train carried 8% more passengers than in 2017. In 2019, it carried 8% more passengers than in 2018. Find the percentage increase from 2017 to 2019.

81. The production cost of a printer consists of cost of raw materials \$100, wood \$100, wages \$120. If raw materials increase by 12%, wood by 11%, and wages decrease by 15%, find the percentage increase or decrease in total cost.

82. Ali is 8% taller than Yi Hao and Vani is 10% shorter than Yi Hao. Express Ali's height as a percentage of Vani's height.

83. The number of girls in a choir is twice that of boys. Find the required percentage increase or decrease in the number of girls if music director increases boys by 30%.

84. Shufen chooses between a 12% increase of salary or 8% increase plus \$1000 annual bonus. Explain which is better if her monthly salary is \$2400.

Answers and short explanations

1. $47\% = 47/100 = 0.47$.
2. $64\% = 0.64$.
3. $0.38 = 38\%$.
4. $4/5 = 80\%$.
5. $0.007 = 0.7\%$.
6. $318\% = 3.18$.
7. $0.2\% = 0.002$.
8. $49 \frac{1}{3}\% = 0.4933\dots$
9. $5.468 = 546.8\%$.
10. $17/2000 = 0.85\%$.
11. 0.036 m.
12. 2.784 kg.
13. 10 students.
14. 15 girls.
15. 36%.
16. 0.75 cm.
17. 100.8 kg.
18. \$115.
19. 37.5%.
20. 75 m.
21. 40%.
22. \$950.
23. 60%.
24. $166 \frac{2}{3}\%$.
25. 64%.
26. 25%.
27. School A: 60%; School B: 40%; School A.
28. Village A: 62.5%; Village B: about 85.7%; Village B.
29. Test 1: 72%; Test 2: 70%; Test 3: 62.5%; best is Test 1.
30. Strawberry has the lowest percentage of sugar.
31. 5%.
32. 5%.
33. About 1.02%.
34. About 4.60%.
35. About 0.44%.
36. $\$336 + \$214 + \$180 = \$730$; original \$700; increase $4 \frac{2}{7}\%$.
37. Area becomes 99% of original, so 1% decrease.

Answers and short explanations continued

- 38. Area becomes 96% of original, so 4% decrease.
- 39. 2 percentage points.
- 40. It is 2 percentage points, but relative increase is $\frac{2}{5} \times 100\% = 40\%$.
- 41. 160 students.
- 42. 50 books.
- 43. \$2100.
- 44. \$300.
- 45. \$3450.
- 46. \$76 222.22... original value.
- 47. 25% profit on cost price.
- 48. Loss = \$3.50; loss as percentage of selling price = 14.3% to 3 s.f.
- 49. 33 $\frac{1}{3}\%$ profit.
- 50. 20% loss on selling price.
- 51. \$635.
- 52. \$73 696.
- 53. 37.5%.
- 54. \$564.
- 55. \$1400.
- 56. \$650.
- 57. \$92.65.
- 58. \$588.99... before GST (about \$589).
- 59. \$100 before discount.
- 60. \$142.80.

Answers and short explanations continued

- 61.** \$4800.
- 62.** \$10 560.
- 63.** \$725 000.
- 64.** \$18 000.
- 65.** 20% profit.
- 66.** \$800.
- 67.** \$18.75.
- 68.** 20%.
- 69.** \$48.60 after discount; total \$52.97 after GST.
- 70.** Marked price \$700; sale price \$651.
- 71.** \$294.30.
- 72.** \$1276.15.
- 73.** \$260 000.
- 74.** \$800.
- 75.** \$245 000.
- 76.** 300 students.
- 77.** 85.
- 78.** 28.
- 79.** 3120.
- 80.** 16.64% increase.
- 81.** New total \$331; original \$320; increase 3.4375%.
- 82.** Ali is 120% of Vani.
- 83.** Compare required girls after boys increase with original girls; accept clear percentage reasoning.
- 84.** Scheme A: \$3456/year increase. Scheme B: \$3304/year increase. Scheme A is better.

Teacher notes

- Use the webpage for concept explanation and this PDF for classwork or homework practice.
- For reverse percentage, always ask: What percentage does the final amount represent?
- Footer spacing and typography have been standardised in this version.
- Use x for unknowns. Reserve $\times$ for multiplication.