

CF MATHS

SAT Math Worksheet

Ratios, Percentages and Proportions

35 exam-style questions • independent practice

■ Practice first. Solutions later.

- 35 original CF Maths SAT-style questions informed by the skill patterns in the supplied Educator Question Bank export
- ratios, rates, unit conversions, proportions, percentages, density, scale, and mixed reasoning
- space to show setup and units
- no solution immediately below any question
- full worked solutions collected together only after Question 35

How to use this worksheet

Complete the questions without looking at the solutions. For every mistake, identify whether the error came from ratio order, unit direction, the percentage base, or arithmetic. Official SAT wording is not reproduced.

Questions 1-35

Question 1 - Ratio order

A box contains 18 green markers and 42 black markers. What is the ratio of green markers to black markers in simplest form?

- A. 3 : 7 B. 7 : 3 C. 18 : 60 D. 6 : 14

Question 2 - Split a total in a ratio

A prize of \$540 is divided between two students in the ratio 4 : 5. How many dollars does the student receiving the larger share get?

Question 3 - Equivalent ratios

The ratio $15 : x$ is equivalent to $9 : 24$. Find x .

Question 4 - Recipe scaling

A drink mixture uses orange juice and sparkling water in the ratio 3 : 8. If 27 cups of orange juice are used, how many cups of sparkling water are needed?

Question 5 - Part of a whole from a ratio

The ratio of juniors to seniors in a club is 5 : 7. What fraction of the club members are seniors?

Question 6 - Unit rate

A cyclist travels 156 miles in 6 hours at a constant rate. What is the average speed, in miles per hour?

Question 7 - Rate to total

A printer produces 38 labels per minute. At this rate, how many labels are produced in 2.5 hours?

Question 8 - Seconds to hours

A probe travels at 2.4 miles per second. What is its speed in miles per hour?

Question 9 - Multi-stage unit conversion

How many fluid ounces are in 37 quarts? Use 4 cups = 1 quart and 8 fluid ounces = 1 cup.

Question 10 - Pounds to ounces

A bakery needs 2.75 ounces of chocolate for each muffin. How many pounds of chocolate are needed for 64 muffins? Use 16 ounces = 1 pound.

Question 11 - Constant of proportionality

The variables x and y are directly proportional. If $y = 18$ when $x = 6$, find y when $x = 15$.

Question 12 - Proportional table

x	2	5	9	14
y	7	17.5	31.5	k

The ratio y/x is constant. Find k .

Question 13 - Recognize proportionality

Which equation represents a proportional relationship?

A. $y = 4x + 3$ B. $y = \frac{5}{2}x$ C. $y = 8 - x$ D. $y = 7$

Question 14 - Scale factor

A model bridge is built at a scale of 1 : 125. If a support beam on the model is 18 cm long, what is the actual beam length, in meters?

Question 15 - Sample estimate

In a random sample of 250 customers, 42 prefer a new subscription plan. Based on this sample, about how many of 12,000 customers would be expected to prefer the plan?

Question 16 - Find a percent of a number

What is 37% of 460?

Question 17 - Find the whole

84 is 35% of what number?

Question 18 - Find the percent

72 is what percent of 320?

Question 19 - Sales tax

A pair of shoes costs \$96 before 8.25% sales tax. What is the total price, to the nearest cent?

Question 20 - Discount

A tablet originally costs \$480 and is discounted by 22%. What is the sale price?

Question 21 - Percent increase

A monthly bill rises from \$68 to \$73.44. What is the percent increase?

Question 22 - Percent decrease

A quantity decreases from 250 to 190. What is the percent decrease?

Question 23 - Reverse increase

After a 16% increase, a quantity is 348. What was the original quantity?

Question 24 - Reverse decrease

After a 25% discount, a jacket costs \$81. What was its original price?

Question 25 - Repeated percentage changes

An investment grows by 12% in one year and by 8% the next year. By what overall percent has the investment increased over the two years?

Question 26 - Increase then decrease

A price is increased by 30% and then decreased by 30%. Compared with the original price, what is the overall percent change?

Question 27 - Tip

A restaurant bill is \$86.40. A customer leaves a 17.5% tip. What is the tip amount?

Question 28 - Nested percentages

A is 160% of B , and B is 75% of C . What percent of C is A ?

Question 29 - Population density

A county has population 184,800 and area 560 square miles. What is its population density, in people per square mile?

Question 30 - Recover area from density

A town has population 91,800 and population density 270 people per square mile. What is the town's area?

Question 31 - Compound rate

A material has density 0.64 ounce per cubic inch and costs \$8.25 per ounce. What is the cost per cubic inch?

Question 32 - Enlarged scale drawing

On a map, 1 inch represents 30 miles. The map is enlarged so every printed length is 25% longer. On the enlarged map, how many actual miles does 1 inch represent?

Question 33 - Area scale factor

A square's side length is increased by 20%. By what percent does its area increase?

Question 34 - Volume scale factor

Every dimension of a cube is multiplied by 1.4. By what percent does the cube's volume increase?

Question 35 - Mixed hard percentage chain

P is 250% of Q . Q is 60% of R . If R is $x\%$ of P , find x to the nearest tenth.

Fully worked solutions

Solutions begin here

The solutions are intentionally collected only after all 35 questions. Compare your setup first, then your arithmetic.

Solution 1

$$18 : 42 = 3 : 7.$$

A

Solution 2

There are $4 + 5 = 9$ equal parts. Each part is $540/9 = 60$. The larger share is $5(60) = \boxed{\$300}$.

Solution 3

$$\frac{15}{x} = \frac{9}{24} \Rightarrow 15(24) = 9x \Rightarrow x = \boxed{40}.$$

Solution 4

The scale factor is $27/3 = 9$. Sparkling water = $8(9) = \boxed{72}$ cups.

Solution 5

There are $5 + 7 = 12$ ratio parts. Seniors represent $\boxed{\frac{7}{12}}$ of the club.

Solution 6

$$156/6 = \boxed{26 \text{ mph}}.$$

Solution 7

2.5 hours = 150 minutes. Thus

$$38(150) = \boxed{5700}.$$

Solution 8

$$2.4 \frac{\text{mi}}{\text{s}} \times 3600 \frac{\text{s}}{\text{h}} = \boxed{8640 \text{ mph}}.$$

Solution 9

$$37 \times 4 \times 8 = \boxed{1184 \text{ fl oz}}.$$

Solution 10

Total ounces:

$$2.75(64) = 176 \text{ oz.}$$

Convert to pounds:

$$176/16 = \boxed{11 \text{ lb}}.$$

Solution 11

so $y = 3x$. At $x = 15$,

$$k = 18/6 = 3,$$

$$y = 45.$$

45

Solution 12

$y/x = 7/2 = 3.5$, so

$$k = 3.5(14) = \mathbf{49}.$$

Solution 13

A proportional relationship has form $y = kx$ and passes through the origin. Only $y = \frac{5}{2}x$ does this. **B**

Solution 14

Actual length = $18(125) = 2250$ cm. Since $100 \text{ cm} = 1 \text{ m}$,

$$2250/100 = \mathbf{22.5 \text{ m}}.$$

Solution 15

Sample proportion:

$$42/250 = 0.168.$$

Estimate:

$$0.168(12,000) = \mathbf{2016}.$$

Solution 16

$$0.37(460) = \mathbf{170.2}.$$

Solution 17

$$0.35W = 84 \Rightarrow W = 84/0.35 = \mathbf{240}.$$

Solution 18

$$72/320 = 0.225 = \mathbf{22.5\%}.$$

Solution 19

Tax multiplier = 1.0825:

$$96(1.0825) = \mathbf{\$103.92}.$$

Solution 20

Discount multiplier = 0.78:

$$480(0.78) = \mathbf{\$374.40}.$$

Solution 21

Increase = $73.44 - 68 = 5.44$:

$$5.44/68 = 0.08 = \mathbf{8\%}.$$

Solution 22

Decrease = 60:

$$60/250 = 0.24 = \boxed{24\%}.$$

Solution 23

$$1.16Q = 348 \Rightarrow Q = 348/1.16 = \boxed{300}.$$

Solution 24

A 25% discount leaves 75%:

$$0.75P = 81 \Rightarrow P = 81/0.75 = \boxed{\$108}.$$

Solution 25

Overall multiplier:

$$1.12(1.08) = 1.2096.$$

Thus the overall increase is $\boxed{20.96\%}$.**Solution 26**

$$1.30(0.70) = 0.91.$$

The final value is 91% of the original, so the overall change is a $\boxed{9\% \text{ decrease}}$.**Solution 27**

$$0.175(86.40) = \boxed{\$15.12}.$$

Solution 28

$$A = 1.60B, \quad B = 0.75C.$$

Thus

$$A = 1.60(0.75C) = 1.20C,$$

so A is $\boxed{120\%}$ of C .**Solution 29**

$$\text{density} = 184,800/560 = \boxed{330 \text{ people/mi}^2}.$$

Solution 30

$$A = 91,800/270 = \boxed{340 \text{ mi}^2}.$$

Solution 31

$$0.64 \frac{\text{oz}}{\text{in}^3} \times 8.25 \frac{\$}{\text{oz}} = \boxed{\$5.28/\text{in}^3}.$$

Solution 32

The print length factor is 1.25. The same 30 miles now spans 1.25 inches:

$$30/1.25 = \boxed{24 \text{ miles per inch}}.$$

Solution 33

Side multiplier = 1.20, so area multiplier

$$1.20^2 = 1.44.$$

Thus the area increases by 44%.

Solution 34

Volume multiplier:

$$1.4^3 = 2.744.$$

The volume is 274.4% of the original, so it increases by

$$274.4\% - 100\% = \text{174.4%}.$$

Solution 35

$$P = 2.50Q, \quad Q = 0.60R.$$

Therefore

$$P = 2.50(0.60R) = 1.50R.$$

So

$$R = \frac{1}{1.50}P = 0.666\dots P,$$

which means R is 66.7% of P to the nearest tenth.