Percentages:

what is 5% of 185?

$X = (.05)(185)$

$X = 9.25$

is ⟶ =

of ⟶ •

what ⟶ X

28 is 16% of what number?

$\frac{28}{.16} = \frac{.16 \cdot X}{.16}$

$X = 175$

what is 5% of 185?

$X = .05 \cdot 185$

28 is 16% of what number?

$28 = .16 \cdot X$

Ratios & Proportions:

proportions are the comparason of two ratios.

If two ratios are equal, then their cross products are also equal.

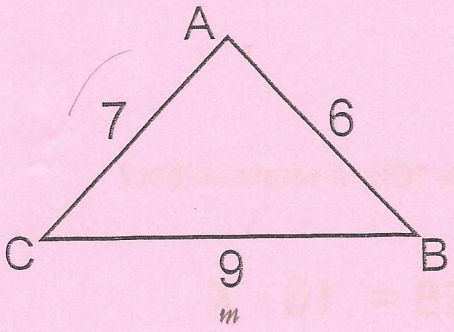
$$\frac{a}{b}=\frac{c}{d} \qquad ad = bc$$

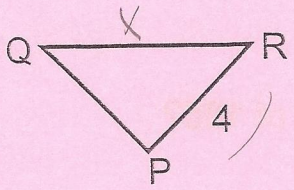
$$\frac{3}{5}=\frac{12}{x} \qquad 3x = 60$$

$$x = 20$$

sides of similar polygons are proportionate.

Given $\Delta ABC \sim \Delta PQR$, find the length of side QR.





$$\frac{7}{9}=\frac{4}{x}$$

$7x = 36$

$x = 5.143$

Examples:

* It takes Paul 12 days to paint 7 toys. At this rate, how long will it take him to paint 45?

$$\frac{12}{7}=\frac{x}{45}$$

$x = 77.14$ days

*You are making pizza dough according to the recipe of 9 parts flour to 2 parts water. You need to make 165 pounds of pizza dough. How many pounds of flour and how many pounds of water should you use?

11 total parts

$$\frac{9}{11}=\frac{x}{165}$$

$$\frac{2}{11}=\frac{x}{165}$$

$x = 30$ lbs water

$x = 135$ lbs flour

1. What is 28% of 600?

(A) 0.47
(B) 21.42
(C) 168
(D) 2,142
(E) 16,800

$x = (.28)(600)$

2. 15 is what percent of 500?

(A) 0.03
(B) 3
(C) 33
(D) 75
(E) 7,500

$\frac{15}{500} = \frac{x(500)}{500}$

.03 ⇒ 3% careful! answer in decimal form

3. 65 is 20 percent of what number?

(A) 0.31
(B) 3.25
(C) 13
(D) 325
(E) 1,300

$65 = (.2)x$

325

4. 300 is what percent of 15?

(A) 4.5
(B) 20
(C) 45
(D) 450
(E) 2000

$300 = x(15)$

20.00

answer in decimal form

6. Diana chose a new pair of shoes marked $120, and the store is having a sale of 20% off everything. How much will she pay for the shoes (excluding sales tax)?

(A) $24
(B) $96
(C) $114
(D) $144
(E) $240

$x = .8(120)$

96

7. Two years ago the average rainfall was 30 inches. If it has increased by 15% per year since then, what is the average annual rainfall now?

(A) 30.0
(B) 34.5
(C) 39.0
(D) 39.7
(E) 67.5

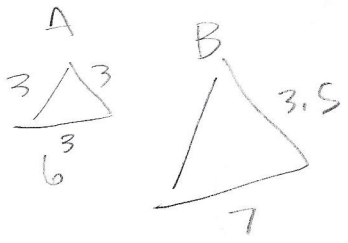
$x_1 = 1.15(30)$

34.5

$x_2 = 1.15 \cdot 34.5$

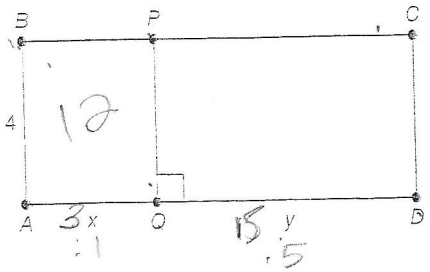
400. Triangle A and triangle B are equilateral triangles such that the ratio of the length of one side of triangle A to the length of one side of triangle B is 6 to 7. If the perimeter of triangle A is 9, what is the length of a single side of triangle B?

(A) $\frac{2}{3}$
(B) $\frac{7}{2}$
(C) 12
(D) 18
(E) 21



$\frac{3}{6} = \frac{x}{7}$

401. In the following figure, $ABCD$ is a rectangle such that $\frac{x}{y} = \frac{1}{5}$. If the area of $ABPQ$ is 12, what is the area of $ABCD$?



4 x 18

(A) 32
(B) 56
(C) 60
(D) 72
(E) 112

402. The ratio of x to y is 2 to 3. If the sum of x and y is 125, what is the value of x?

(A) 15
(B) 25
(C) 50
(D) 75
(E) 100

$x + y = 125$

$\frac{x}{y} = \frac{2}{3}$

$\frac{2}{3}y + \frac{3}{3}y = 125$

$\frac{5}{3}y = 125$

$y = \frac{3}{5}125$

$y = 75$

$x =$

403. Which of the following represents 0.2% of $\frac{1}{5}$?

(A) $\frac{1}{25,000}$
(B) $\frac{1}{2500}$
(C) $\frac{1}{250}$
(D) $\frac{1}{25}$
(E) $\frac{1}{10}$

$X = .002 \cdot \frac{1}{5}$

4 E-4

405. Every student enrolled in a science course is either a physics major or a biology major. If the ratio of physics majors to biology majors is 3 to 1 and there are 21 physics majors enrolled, how many biology majors are enrolled in the course?

(A) 7
(B) 15
(C) 23
(D) 45
(E) 63

$\frac{P}{B}\ \frac{3}{1} = \frac{21}{X}$

407. The value of a positive number x is 30% of the value of a positive number y. If 20% of y is 8, what is the value of x?

(A) 10
(B) 12
(C) 16
(D) 40
(E) 70

$X = .3y$ $\quad .2y = 8$ $\quad y = 40$

$\frac{.2y}{.2} = \frac{8}{.2}$

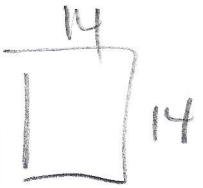
$X = .3(40)$

410. If the length of one side of a square is 28% of 50, then the area of the square is equal to

(A) 70
(B) 84
(C) 140
(D) 196
(E) 289

$X = .28 \cdot 50$

$X = 14$ Area



411. If q% of 30 is 21, then q =

(A) 50
(B) 60
(C) 70
(D) 80
(E) 90

$q\% \cdot 30 = 21$

$.7$

413. Of 600 items in a storage closet, 40% are pens or pencils, 10% are first-aid items, and 5% are notebooks. How many items in the storage closet have not been described?

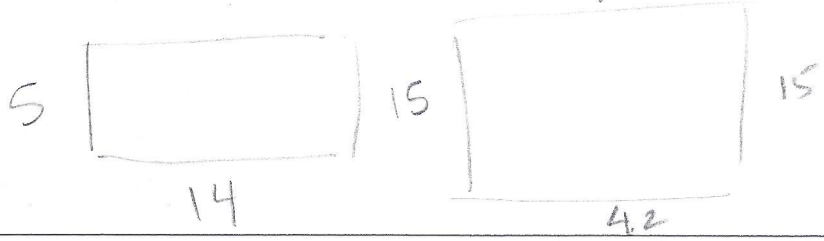
(A) 45
(B) 60
(C) 240
(D) 270
(E) 300

$45\% \cdot 600$

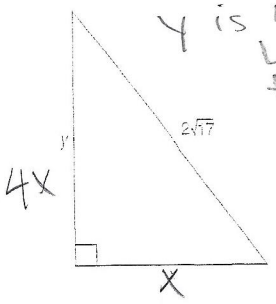
364. A rectangle has a width of 5 meters and a length of 14 meters. If a similar rectangle has a width of 15 meters, what is its perimeter, in meters?

(A) 42
(B) 58
(C) 60
(D) 78
(E) 114

42



416. In the following figure, the ratio of x to y is 1:4. What is the value of x?



y is 4 times Longer than x

$x^2 + (4x)^2 = (2\sqrt{17})^2$

$x^2 + 16x^2 = (2\sqrt{17})^2$

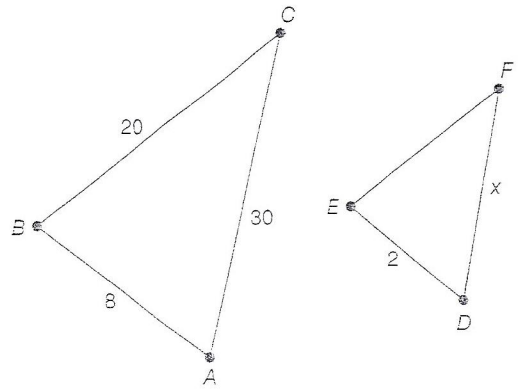
$17x^2 = 4 \cdot 17$

$x^2 = 4$

$x = 2$

(A) 1
(B) 2
(C) 8
(D) 10
(E) 13

367. In the following figure, triangles ABC and DEF are similar. What is the value of x?



Note: Image not to scale

$\frac{BX}{2} = \frac{30 \cdot 2}{x}$

$\frac{8x}{8} = \frac{60}{8}$

$x = 7.5$

(A) 5.0
(B) 7.5
(C) 15.0
(D) 24.0
(E) 36.5

361. If M% of 135 is 54, then M =

(A) 2.5
(B) 4
(C) 25
(D) 40
(E) 81

$M \cdot 135 = 54$

$\frac{M \cdot 135}{135} = \frac{54}{135}$

$M = .4$

$M = 40\%$

362. In a large company, the ratio of full-time to part-time employees is 3:2. If there are 800 total employees, how many are part-time?

(A) 260
(B) 320
(C) 400
(D) 480
(E) 530

Full : Part-time
3 : 2 5 total

800 total
2/5 are Part-time

480 FT : 320 PT

373. In an election with two parties, Party A won 54% of the votes. If Party B received 874 votes, how many votes were cast in total?

(A) 400
(B) 472
(C) 1619
(D) 1900
(E) 2102

Party B: 46% Vote

874 is 46% of total votes

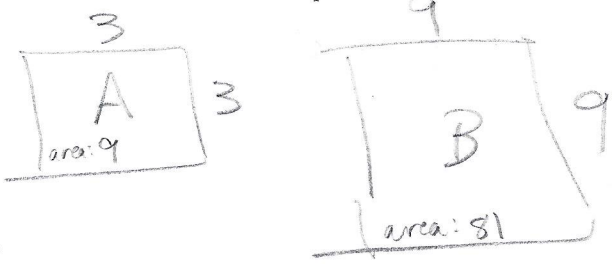
$874 = .46 \cdot X$

$\frac{874}{.46} = \frac{.46 \cdot X}{.46}$

$X = 1900$

374. Each side of square A has a length of 3 meters, while each side of square B has a length of 9 meters. What is the ratio of the area of square A to the area of square B?

(A) 1:1
(B) 1:3
(C) 1:6
(D) 1:9
(E) 1:12



9 : 81
1 : 9

375. The ratio of the lengths of each of the sides of a triangle is 4:12:14. If the shortest side has a length of 2 feet, what is the perimeter of the triangle in feet?

(A) 15
(B) 24
(C) 34
(D) 57
(E) 68

4 : 12 : 14
2 : 6 : 7
Perimeter $2+6+7 = 15$

376. In a college with 14,000 students, 490 are majoring in mathematics. What percentage of the student body does the number of math majors represent?

(A) 0.0035%
(B) 0.035%
(C) 0.35%
(D) 3.5%
(E) 35%

$\frac{490}{14000} = \frac{X \cdot 14000}{14000}$

$.035 = X$

$\rightarrow 3.5\%$

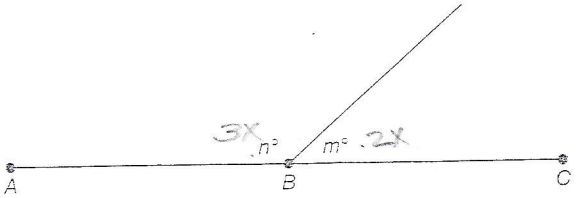
369. If 80% of $x + 1$ is 2, then $x =$

(A) 0.975
(B) 1.25
(C) 1.5
(D) 4
(E) 5.1

$\frac{.8 \cdot (X+1)}{.8} = \frac{2}{.8}$

$X + 1 = 2.5$
$-1 \quad -1$
$X = 1.5$

417. Points A, B, and C in the following figure are collinear. If the ratio of m to n is 2:3, what is the value of n in degrees?

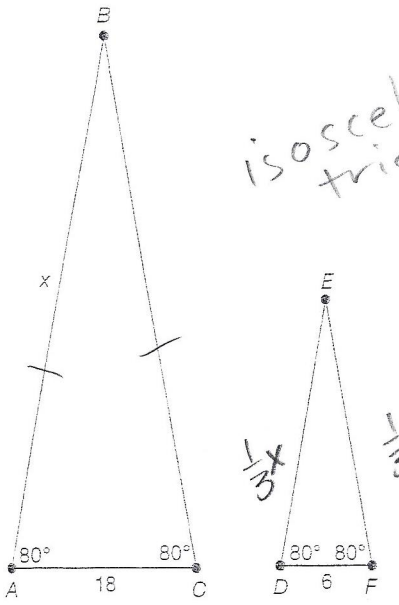


(A) 36
(B) 94
(C) 108
(D) 120
(E) 170

$2x + 3x = 180$
$5x = 180$
$x = 36$
So $n = 3 \cdot 36$
$n = 108°$

$m = 2 \cdot 36$
$m = 72°$

398. The triangles in the following figure are similar. In terms of x, what is the perimeter of triangle DEF?



Note: Image not to scale

isosceles triangles.

scale factor: $\frac{1}{3}$

$\frac{1}{3}x$ $\frac{1}{3}x$ $\frac{2}{3}x+6$

(A) $\frac{x}{6}+6$

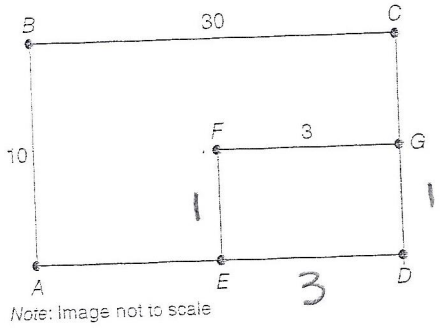
(B) $\frac{x}{3}+6$

(C) $\frac{2x}{3}+6$

(D) $2x+6$

(E) $6x+6$

378. In the following figure, rectangles $ABCD$ and $EFGD$ are similar. What is the perimeter of $EFGD$?



Note: Image not to scale

Scale factor: $\frac{1}{10}$

$1+3+1+3=8$

(A) 4

(B) 8

(C) 26

(D) 30

(E) 40

425. A tenant's monthly rent of $675 will be increased by 3% every year. To the nearest cent, what will be the tenant's monthly rent in 3 years?

(A) $695.25

(B) $735.75

(C) $737.59

(D) $781.02

(E) $794.66

yr 1: $675(1.03) = 695.25$

yr 2 $695.25(1.03) = 716.11$

yr 3 $716.11(1.03) = 737.59$

384. The length of a rectangle is 40% larger than its width. If the area of the rectangle is 140 square feet, what is the width of the rectangle in feet?

(A) 10
(B) 22
(C) 35
(D) 56
(E) 64

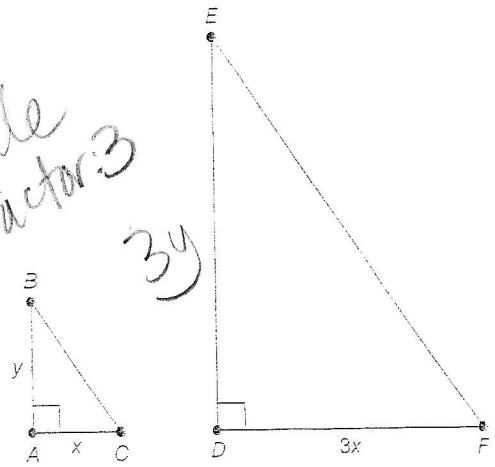
width × 1.4x = 140
10 × 14 = 140

$\frac{1.4x^2}{1.4} = \frac{140}{1.4}$

$x^2 = 100$

$x = 10$

385. In the following figure, triangles ABC and DEF are similar. Which of the following expressions represents the area of DEF in terms of x and y?



scale factor 3

3y

area $= \frac{1}{2}(3y)(3x)$

$= \frac{1}{2} \cdot 9xy$

$= \frac{9xy}{2}$

(A) $\frac{xy}{2}$
(B) $\frac{3xy}{2}$
(C) $3xy$
(D) $\frac{9xy}{2}$
(E) $6xy$

---

389. If the ratio of x to y is 1:6, what is the difference between y and x when $x = 12$?

(A) 5
(B) 12
(C) 17
(D) 60
(E) 72

$\frac{x}{y} \quad \frac{1}{6} = \frac{12}{y}$

$y = 72$

$y - x = ?$

$72 - 12 = 60$

380. If 80% of a number is 122, what is 40% of the number?

(A) 48.8
(B) 61.0
(C) 73.2
(D) 83.0
(E) 244.0

$\frac{.8x}{.8} = \frac{122}{.8}$

$x = 152.5$

$y = .4(152.5)$