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Centre for Education in
Mathematics and Computing

Grade 6 Math Circles

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Mental Math and Conversions

Calculators away! We will not be using them for this lesson.

Adding in Parts

General Rule: Add from the largest place values to the smallest place values (ie. Move from left to right). To do this, we expand each number, add all of our numbers together that have the same number of digits, and then add the sums of these answers up.

Adding Examples:

1. $32 + 44$

   (a) Expanding these numbers, we get...

   $30 + 2 + 40 + 4$

   (b) Add the 2-digit numbers first:

   $30 + 40 = 70$

   (c) Add the 1-digit numbers:

   $2 + 4 = 6$

   (d) Add the sums from b and c:

   $70 + 6 = 76$

2. $1355 + 206$

   (a) Expanding these numbers, we get...

   $1000 + 300 + 50 + 5 + 200 + 6$

   (b) Add the 4-digit numbers first:

   1000

   (c) Add the 3-digit numbers:

   $300 + 200 = 500$

   (d) Add the 2-digit numbers:

   50

   (e) Add the 1-digit numbers:

   $5 + 6 = 11$

(f) Add the sums from b,c,d and e:

$1000 + 500 + 50 + 11$
$= 1500 + 61$
$= 1561$

Exercises:

1. $3561 + 1223$

   (a) Add the thousands:

      i. $3000 + 1000 = 4000$

   (b) Add the hundreds

      i. $500 + 200 = 700$

   (c) Add the tens

      i. $60 + 20 = 80$

   (d) Add the ones

      i. $1 + 3 = 4$

   (e) Put them together:

      i. $4000 + 700 + 80 + 4 = 4784$

2. $6577 + 5643$

   (a) Add the thousands

      i. $6000 + 5000 = 11{,}000$

   (b) Add the hundreds

      i. $500 + 600 = 1100$

   (c) Add the tens

      i. $70 + 40 = 110$

   (d) Add the ones

      i. $7 + 3 = 10$

   (e) Put them together

      i. $11{,}000 + 1100 + 110 + 10 = 12{,}100 + 120 = 12{,}220$

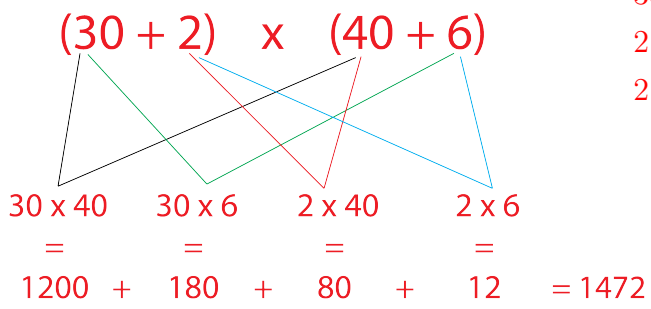
Multiplying In Parts

For multiplying big numbers in your head, it is important to know your times tables (up to 12×12) very well.

General Rule for multiplying two digit numbers and beyond: Like adding and subtracting, we will multiply from left to right. Multiply the largest place value of the first number by EACH place value in the second number and move right until you have multiplied the smallest place value in the first number by EACH place value in the second number. This makes more sense when we think of multiplication as grouping.

Example:

1. 32×46



We need...
30 groups of 40
30 groups of 6
2 groups of 40
2 groups of 6

Exercises:

1. Multiply your age by 62

2. 321×505

You will need...
300 groups of 500
300 groups of 0
300 groups of 5
20 groups of 500
20 groups of 0
20 groups of 5
1 group of 500
1 group of 0
1 group of 5
= 162,105

3. 45×2.2

You will need...
40 groups 2
40 groups of 0.2
5 groups of 2
5 groups of 0.2
= 99

Divisibility Tricks

How can we tell if a number is divisible by another number?

The following tricks are useful in determining if a number is divisible by different digits:

1. Is your number divisible by 2?
    - If your number is an even number, then yes!
        (a) Is my number an even number? If the last digit is even, the whole number is even!
    - Example: Is 572 divisible by 2?

    The last digit of 572 is even, therefore 572 is an even number and is divisible by 2.

2. Is your number divisible by 3?
    - Add up all the digits in your number. If this sum is divisible by 3, your number is also divisible by 3.
    - Example: Is 755 divisible by 3?

    Adding the digits of the number, we get $7 + 5 + 5 = 17$. Since 17 is not divisible by 3, 755 is not divisible by 3.

3. Is your number divisible by 4?
    - If the number formed by the last two digits of your number is divisible by 4, so is your number.
    - Example: Is 612 divisible by 4?

    The last two digits of 612 form the number 12. Since 12 is divisible by 4, 612 is divisible by 4.

4. Is your number divisible by 5?
    - If your number ends in a 5 or 0, it is divisible by 5.
    - Example: Is 98 divisible by 5?

Since 98 ends in an 8, not a 5 or a 0, it is not divisible by 5.

5. Is your number divisible by 6?

   - If your number is divisible by 2 AND 3, it is divisible by 6.
   - Example: Is 6 a factor of 4323?

   Though 4323 is divisible by 3, it is not divisible by 2 because the last digit is a 3 and hence this is not an even number. So, 6 is not a factor of 4323.

6. Is your number divisible by 7?

   - Double the last digit in your number.
   - Subtract this value from the rest of your digits.
   - If the resulting number is divisible by 7, your original number is divisible by 7.
   - Can repeat if resulting number still too large.
   - Example: Is 2331 divisible by 7?

   Double the 1 to get 2.
   233 - 2 = 231. Is 231 divisible by 7? Let's repeat the process.
   Double the 1 at the end of 231 to get 2.
   23 - 2 = 21.
   Is 21 divisible by 7? Yes.
   So, 2331 is divisible by 7.

7. Is your number divisible by 8?

   - If the number formed by the last three digits are divisible by 8, yes.
   - If the number is odd, it will not be divisible by 8.
   - Example: Is 52,016 divisible by 8?

   The last 3 digits here are 016. 016 (ie. Just 16) is divisible by 8, so 52,016 is divisible by 8.

8. Is your number divisible by 9?

   - Add up all the digits in the number, if the sum is divisible by 9, yes.
   - Example: Is 7222 divisible by 9?

   Adding all the digits, we get $7 + 2 + 2 + 2 = 13$. Since 13 is not divisible by 9, 7222 is not divisible by 9.

9. Is your number divisible by 10?

   - If it ends in a zero, yes.
   - Example Is 56,785 divisible by 10?

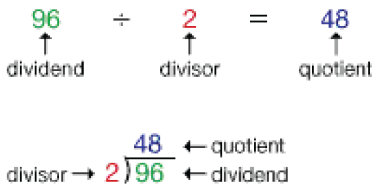
   The last digit here is a 5, not a 0, so 56,785 is not divisible by 10.

Exercise:

1. List all the numbers from 1 to 10 that are factors of 2346.

   1, 2, 3, 6

Dividing in Parts



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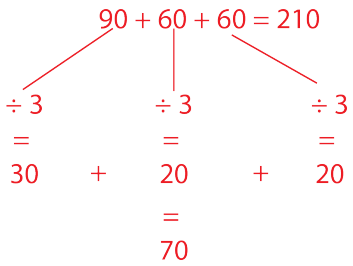
Splitting the dividend:

If we split the dividend into two or more numbers that add up to the dividend and can more easily be divided by the divisor, we can just divide each of these two (or more) numbers by the divisor and **add** up our results. This will give us the quotient.

Example:

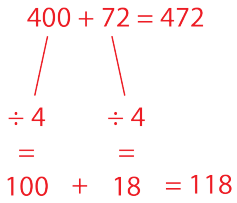
1. $210 \div 3$

   - Let's first use our divisibility rule to see if 210 is divisible by 3: $2 + 1 + 0 = 3$ and 3 is divisible by 3, so 210 is divisible by 3.
   - Let's think of some numbers that are divisible by 3 that add to 210, you can use any numbers that follow that criteria.
   - Let's use $90 + 60 + 60 = 210$

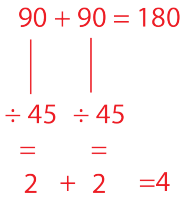


Exercises:

1. $472 \div 4$



2. $180 \div 45$



Splitting the Divisor:

If we split our divisor into two or more numbers that multiply to give us our divisor and that we are more easily able to divide into the dividend, we can just divide the dividend by one of these numbers and divide this result by our other number. This will give us the quotient.

Example:

1. $654 \div 6$

- Can we split the divisor, 6, into 2 numbers? Let's split it into 2×3.
- Using divisibility rules, is 654 divisible by 2? Yes! Because it is an even number.
  (a) Ok, so what is $654 \div 2$?
  (b) Well, we know that $600 \div 2 = 300$
  (c) And we know that $50 \div 2 = 25$
  (d) And we know that $4 \div 2 = 2$
  (e) Add the sums of b, c and d:
    i. $654 \div 2 = 300 + 25 + 2 = 327$
- Using divisibility rules, is 327 divisible by 3? Yes! Because $3 + 2 + 7 = 12$, which is divisible by 3.
  (a) So, what is $327 \div 3$?
  (b) Well, we know that $300 \div 3 = 100$

(c) We know that $27 \div 3 = 9$

(d) Add the sums of b and c:

i. $327 \div 3 = 100 + 9 = 109$

- Therefore, $654 \div 6 = 109$

Exercises:

1. $520 \div 8$

- Let's split 8 into 2×4.
- What's $520 \div 2$? Use splitting the dividend method.

(a) $500 \div 2 = 250$

(b) $20 \div 2 = 10$

(c) Add the results of a and b to get 260.

- What's $260 \div 4$? Use splitting the dividend method again.

(a) $200 \div 4 = 50$

(b) $60 \div 4 = 15$

(c) Add the results of a and b to get 65.

2. $288 \div 12$

- Let's split 12 into 2×6.
- What's $288 \div 2$? Use splitting the dividend method.

(a) $200 \div 2 = 100$

(b) $88 \div 2 = 144$

(c) Add the results from a and b to get 144.

- What's $144 \div 6$? we can use the splitting the divisor method again here.

(a) Let's split 6 into 2×3.

(b) $100 \div 2 = 50$

(c) $44 \div 2 = 22$

(d) Add the results of b and c to get 72.

(e) What's $72 \div 3$? Split the dividend again.

i. Split 72 into $36 + 36$.

ii. $36 \div 3 = 12$

iii. $36 \div 3 = 12$

iv. Add the results of b and c to get 24.

Dividing by Multiplying:

When dividing with large numbers, it can be helpful to start with one number to multiply the divisor by. Then, depending on how close your answer is to your dividend, multiply your divisor by a new number. Repeat the process until you get an answer that is very close to your dividend. Once this happens, you know that the number you multiplied your divisor by is approximately your quotient. You can then take your remainder.

Example:

1. $4593 \div 54$

- Let's multiply 54 by some numbers:

(a) $54 \times 10 = 540$

(b) $54 \times 20 = 1080$

(c) $54 \times 40 = 2000 + 160 = 2160$

(d) $54 \times 80 = 4000 + 320 = 4320$, close!

(e) $54 \times 85 = 4000 + 250 + 320 + 20 = 4250 + 340 = 4590$

- So we can see that 54 goes into 4593 around 85 times, but we still have three left over
- So we know that 54 really goes into 4593 a little more than 85 times
- $4593 \div 54 = 85$ remainder 3

Exercises:

1. $1452 \div 44$

   note that you may have used different numbers, as long as you got the correct answer that is fine.
   Try $44 \times 20 = 800 + 80 = 880$, too small.
   Try $44 \times 40 = 1600 + 160 = 1760$, too big.
   Try $44 \times 30 = 1200 + 120 = 1320$, close.
   Try $44 \times 35 = 1200 + 120 + 200 + 20 = 1540$, still a little big.
   Try $44 \times 33 = 1200 + 120 + 120 + 12 = 1452$!!!
   So our answer is 33.

2. $2366 \div 23$

   Try $23 \times 50 = 1000 + 150 = 1150$, too small.
   Try $23 \times 100 = 2000 + 300 = 2300$, close.
   Try $23 \times 103 = 2000 + 300 + 60 + 9 = 2369$, a little too big.
   Try $23 \times 102 = 2000 + 300 + 40 + 6 = 2346$.
   Notice that 2366 - 2346 = 20, so we cannot fit another 23 into 2366.
   So, our answer is 102 remainder 20.

Squaring Numbers Trick

Quick Review: Squaring numbers is when we multiply a number by itself

$$4^2 = 4 \times 4 = 16$$

Say we want to square the number 408. How do we do this?

1. Pick a number close to 408 that is easier to multiply with:

   400

2. To get from 408 to 400, we went down by 8, so now we must go up by 8:

   416

3. Multiply 400×416

   - $400 \times 400 = 160,000$
   - $400 \times 10 = 4000$
   - $400 \times 6 = 2400$
   - $00 \times 400 = 0$
   - $00 \times 10 = 0$
   - $00 \times 6 = 0$
   - $0 \times 400 = 0$
   - $0 \times 10 = 0$
   - $0 \times 6 = 0$
   - Add the sums of all of these
     (a) 160,000 + 4000 + 2400 = 166,400

4. Now, since we went up and down by 8, we square 8

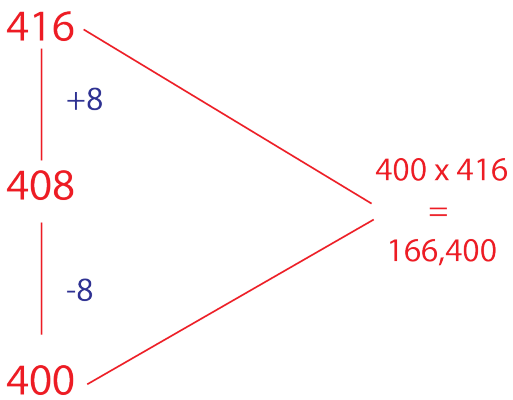
   $8^2 = 64$

5. Add 64 to 166,400

   $164,800 + 64 = 166,464$

6. So $408^2 =$

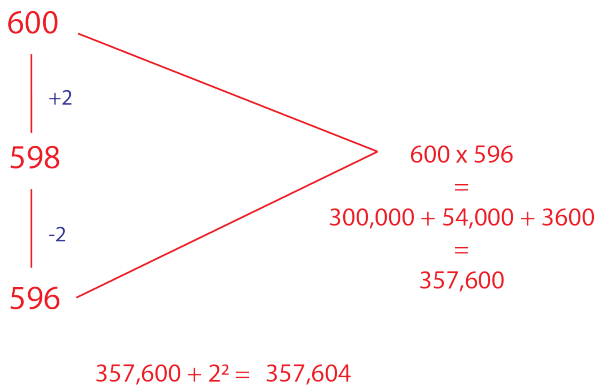
   166,464



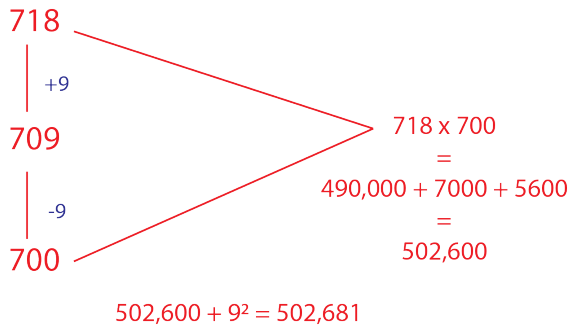
$166,400 + 8^2 = 166,464$

Exercise:

1. What is the square of 598?



2. What is the square of 709?



Useful Conversions

Different units can be used to describe the same quantities. For example...

- metres, centimetres, millimetres, kilometres and miles can all be used to describe **distance**.
- seconds, minutes, hours, days and years can all be used to describe **time**.
- mg, g, kg and lbs can all be used to represent **mass**.

There also exists different systems of measurement in different countries. In Canada we use the metric system, whereas in the United States they use the imperial system of measurement.

Why do we want to be able to convert between units?

- So that we can correctly use equations.
  - For example, if you know distance (d) in metres and time (t) in hours and you want to find velocity (v), where $v = \frac{d}{t}$ in m/s or km/h, you want to be able to convert either metres to kilometres or hours to seconds in order to calculate a velocity that we can understand (m/h is not common therefore it is hard to understand just how fast this is).
- So that we can understand what Americans are talking about.

Converting between Fahrenheit and Celsius:

When an American tells you the temperature.....but they tell you in Fahrenheit...

1. Subtract 32 from the temperature in Fahrenheit.
2. Multiply your result by 5.
3. Divide this by 9.

Example:

1. An American tells you it is 78° F outside, what does that mean??? Let's convert to Celsius.

   78 - 32 = 46
   $46 \times 5 = 230$
   $230 \div 9$
   Try $9 \times 25 = 225$
   So, $230 \div 9 = 25$ R 5, or ≈ 26.
   So, it is about 26° C outside. Now we know that it must fairly warm.

Converting between pounds and kilograms:

1 kg $\approx$ 2.2 lbs

So to convert from kg to lbs, we multiply our number by 2.2.
To convert from lbs to kg, we divide our number by 2.2.

Example:

1. You buy 4.41 kg of apples at the superstore. The price for apples is \$3/lbs. How much money will you have to pay? (Do not include tax).

   - Let's convert our 4.41 kg to lbs.
   - 4.41×2.2
     (a) $4 \times 2 = 8$
     (b) $4 \times 0.2 = 0.8$
     (c) $0.4 \times 2 = 0.8$
     (d) $0.4 \times 0.2 = 0.08$
     (e) $0.01 \times 2 = 0.02$
     (f) $0.01 \times 0.2 = 0.002$
     (g) Add the sums from a, b, c, d, e and f.
         i. $8 + 0.8 + 0.8 + 0.08 + 0.02 + 0.002 = 9.702$ lbs.
   - So, we have approximately 9.7 lbs of apples.
   - Since it costs \$3 per lbs, we just multiply \$3 by 9.7 because that is how many lbs of apples we have, and we have to pay \$3 for every lbs.
   - $\$3 \times 9.7 = \$29.10$
     (a) $3 \times 9 = 27$
     (b) $3 \times 0.7 = 2.1$
     (c) Add the sums from part a and b.
         i. $27 + 2.1 = 29.1$
   - Therefore, our total should be \$29.10 without tax.

Converting between miles and kilometres:

1 mile $\approx$ 1.6 km

So to convert to from miles to km, multiply the number of miles by 1.6. To convert from km to miles, divide the number of miles by 1.6.

Example:

1. You see a sign while driving in Chicago that indicates that the speed limit is 35 miles/hr, but your Canadian car shows you your speed in km/hr. Convert the speed limit to km/hr.

    - Let's convert 35 miles to km
    - 35×1.6
        (a) $30 \times 1 = 30$
        (b) $30 \times 0.6 = 18.0$
        (c) $5 \times 1 = 5$
        (d) $5 \times 0.6 = 3.0$
        (e) Add the sums from a, b, c and d.
            i. $30 + 18.0 + 5 + 3.0 = 56$
    - So, the speed limit is 56 km/h. Make sure you don't go above this speed on your speedometer!

Converting between inches and cm:

1 inch = 2.54 cm

So to convert from inches to cm, multiply the number of inches by 2.54.
To convert from cm to inches, divide the number of cm by 2.54.

Example:

1. You buy a box in the United States with dimensions 11 in $\times$11 in $\times$11 in, you want to know what the dimensions are in cm. What are they?

    - Convert 11 in to cm.
    - 11×2.54
        (a) $10 \times 2 = 20$
        (b) $10 \times 0.5 = 5.0$
        (c) $10 \times 0.04 = 0.40$
        (d) $1 \times 2 = 2$
        (e) $1 \times 0.5 = 0.5$
        (f) $1 \times 0.04 = 0.04$
        (g) Add the sums from a, b, c, d, e and f.
            i. $20 + 5.0 + 0.40 + 2 + 0.5 + 0.04 = 27.94$
    - So, the box is 27.94 cm $\times$27.94 cm $\times$27.94 cm.

Problem Set

The following questions should be done in your head with minimal writing on the page, unless otherwise specified.
* indicates challenge questions.

1. Which of the following numbers is a multiple of 9? ie. Which number is divisible by 9? (From grade 7 Gauss contest)

    (A) 50 (B) 40 (C) 35 (D) 45

    (E) 55

Answer: D

2. Write down all of the numbers from 1 to 10 that are factors of...

   (A) 651 (B) 6654 (C) 8740 (D) 3672

   A) 1, 3, 7
   B) 1, 2, 3, 6
   C) 1, 2, 4, 5, 10
   D) 1, 2, 3, 4, 6, 8, 9

3. How many positive whole numbers, including 1, divide exactly into both 40 and 72? (From 2007 grade 7 Gauss contest)

   Answer: 4 (1, 2, 4, 8)

4. A regular hexagon is a shape with six sides. Each side has the same length and this length is a whole number. The perimeter (total of all six side lengths) of this hexagon *cannot* equal

   (A) 1992 (B) 2322 (C) 3454 (D) 4542

   Answer: C
   The perimeter of the hexagon will be the length of each side added together, but the length of each side is the same, so the perimeter will be the length of one side times 6 (because there are 6 sides). So, the perimeter of the hexagon must be a number that is divisible by 6. All numbers here except for 3454 are divisible by 6, hence the perimeter cannot be 3454.

5. *The positive integer n has exactly 8 positive divisors including 1 and n. Two of these divisors are 14 and 21. What is the sum of all 8 positive divisors of n? It will be helpful to write on a piece of paper for this question to keep track of your numbers. Hint: If 14 and 21 are factors of n, factors of 14 and 21 are also factors of n. (From 2019 grade 7 Gauss contest).

Answer: 96

The divisors/factors of 14 are 1, 2, 14. The divisors of 21 that have not already been mentioned are 3, 7, 21. From looking at these divisors, we see that $2 \times 21 = 42$, $3 \times 14 = 42$, so we can guess that n is probably 42, which is also one of our divisors. We also know that $7 \times 6 = 42$, so 6 is also a divisor of 42. We now have all 8 divisors and can add them up to get 96.

6. *Each of the integers 334 and 419 has digits whose product is 36. How many 3-digit positive integers have digits whose product is 36? You will need to write this one down. Hint: Start by finding all 1 digit numbers that are factors of 36. (From 2019 grade 7 Gauss contest)

Answer: 21

The one-digit factors of 36 are 1, 2, 3, 4, 6, 9.

Now we must find the different ways that we can multiply combinations of three of these numbers together to get 36:

$9 \times 4 \times 1$

$6 \times 6 \times 1$

$9 \times 2 \times 2$

$6 \times 3 \times 2$

$3 \times 3 \times 4$

Now that we have all possible combinations, write out all the possible ways that you can write a 3-digit number in each combination of numbers. Make sure you have no repeats.

For 9,4 and 1 we can have 941, 914, 419, 491, 194, 149.

For 6, 6 and 1 we can have 661, 616, 166.

Notice that when we have 3 separate digits, there are 6 possible different ways to arrange the numbers and when we have 2 separate digits and 1 repeat, there are 3 possible different ways to arrange the numbers. So...

For 9, 2 and 2 we can have 3 different 3-digit numbers.

For 6, 3 and 2 we can have 6 different 3-digit numbers.

For 3, 3 and 4 we can have 3 different 3-digit numbers.

Adding all of the possible ways to arrange the numbers in each combination, we get $6 + 3 + 3 + 6 + 3 = 21$.

7. Calculate.... (In your head!!)

(A) $56 + 98$ (B) $683 + 255$ (C) $974 + 665$ (D) $1234 + 5678$

(E) $6890 + 4388$

A) 154
B) 938
C) 1639
D) 6912
E) 11,278

8. The following T-charts show the points scored by two different basketball teams over the course of 10 games. The team with the most overall points at the end of the season wins a vacation to Hawaii. Which team has the most overall points so far?

The Lions

Game	Points
1	77
2	82
3	103
4	91
5	68
6	71
7	78
8	77
9	97
10	84

The Tigers

Game	Points
1	88
2	83
3	59
4	76
5	67
6	99
7	111
8	73
9	89
10	90

Answer: The Tigers.
The Lions have a total of 828 points and The Tigers have a total of 835 points.

9. Calculate: (in your head!!!)

   (A) 23×9 (B) 32×76 (C) 445×65 (D) 777×234

   (E) 7638×2948 (F) 9283×2783

   A) 207
   B) 2432
   C) 28,925
   D) 181,818
   E) 22,516,824
   F) 25,834,589

10. The fence that encloses my yard has a length of 33 m and a width of 56 m. What is the area of my yard?

    Answer: Area = length $\times$ width. So we have to multiply $33 \times 56 = 1848$ m^2.

11. Calculate: (in your head!)

    (A) $150 \div 3$ (B) $819 \div 9$ (C) $132 \div 4$ (D) $328 \div 8$

    (E) $5690 \div 50$ (F) $3456 \div 64$

    A) 50
    B) 91
    C) 33
    D) 41
    E) 113 remainder 40
    F) 54

12. A regular octagon is a shape with eight sides. All side lengths are equal. If the perimeter of this octagon is 216 cm, what is the length of each side of the octagon?

    Since each side has equal length, each side has length $216 \div 8 = 27$ cm.

13. Find the missing number: $12 \times 24 \times 34 = 34 \times 36 \times$ _____

Answer: 8
$12 \times 24 \times 34 = 9792$
$34 \times 36 = 1224$
So $1224 \times$ _____ $= 9792$. We can solve this by calculating $9792 \div 1224 = 8$.

14. A goat, a horse and a giraffe go to Walmart. In total, they spent \$456 all together. If the goat spent one third of this total and the horse spent one fourth of this total, how much money did the giraffe spend?

Answer: \$190
If the goat spent one third of \$456, the goat spent $456 \div 3 = \$152$. If the horse spent one fourth of this total, the horse spent $456 \div 4 = \$114$. Now we subtract $152 + 114$ from 456 to find the remaining amount of this money, which the giraffe spent: $456 - 266 = 190$.

15. Bobby is 13 years old. If he multiplies his age by 14, then adds 28, then divides by 7 and finally subtracts twice his age, what number does he get?

Answer: 4
$13 \times 14 = 182$
$182 + 28 = 210$
$210 \div 7 = 30$
$30 - (2 \times 13) = 4$

16. Square...

(A) 14 (B) 43 (C) 101 (D) 643

(E) 989 (F) 1203

A) 196
B) 1849
C) 10,201
D) 413,449
E) 978,121
F) 1,447,209

17. Convert the following temperatures to Celsius

(A) 75° F (B) 53° F (C) 108° F (D) 82° F

(E) 32° F (F) 80° F

A) 23 remainder 8, ≈ 24° C (if the remainder is 4 or below, round down. If it is 5 or higher, round up).
B) 11 remainder 6, ≈ 12° C
C) 42 remainder 2, ≈ 42° C
D) 27 remainder 7, ≈ 28° C
E) 0° C
F) 26 remainder 6, ≈ 27° C

18. *The temperature outside is 23° C, what is this temperature in Fahrenheit?

Answer: ≈ 73° F
We must do our steps in reverse and use the opposite calculations:
Multiply by 9: $23 \times 9 = 207$
Divide by 5: $207 \div 5 = 41$ remainder $2 \approx 41$
Add 32: $41 + 32 = 73$

19. While at the vet, I have to write down my dog's weight in lbs on a form. I know my dog weighs 45 kg, how much does he weigh in lbs?

Answer: 99 lbs
To convert from kg to lbs, we multiply 45 by 2.2:

- 45×2.2
  (a) $40 \times 2 = 80$
  (b) $40 \times 0.2 = 8.0$
  (c) $5 \times 2 = 10$
  (d) $5 \times 0.2 = 1.0$
  (e) Add the sums of a, b, c, d: $80 + 8.0 + 10 + 1.0 = 99$

20. *If I buy 32 lbs of beef at the grocery store, how many kg of beef did I buy?

Answer: Approximately 14.55 kg.
We are converting from lbs to kg, we must do the opposite calculation: $32 \div 2.2$
When dividing by decimals, it is easier to covert the decimal to a fraction.
0.2 is equivalent to $\frac{1}{5}$. So convert 2.2 to $2 + \frac{1}{5}$. We then get $\frac{11}{5}$.
Now we divide 32 by $\frac{11}{5}$. This is the same as multiplying 32 by $\frac{5}{11}$: $32 \times \frac{5}{11} = \frac{160}{11}$.
Now divide 160 by 11 to get a decimal answer.
We know $11 \times 14 = 154$. So $160 \div 11 = 14$ remainder 6.
Can we write this as a fraction? Yes!
We write our remainder as a fraction out of our divisor. $\frac{6}{11}$.
We know that 6 is a little more than half of 11 (half of 11 is 5.5). So the decimal we add to 14 will be more than 0.5, can we write 0.6? No, because 0.6 written as a fraction is $\frac{60}{100}$, or $\frac{6}{10}$. But $\frac{6}{10} > \frac{6}{11}$. So the decimal we add the 14 should be between 0.5 and 0.6. We can approximate this as 0.55. So we can say $32 \div 2.2 = 14.55$.

21. Janice sets a goal to run 5 miles once a week. She keeps track of how many miles she has ran on her phone, but her phone tells her how many km she has ran. Janice tries to convert 5 miles to km by calculating 5×1.6 with the following steps:

(a) $5 \times 1 = 5$

(b) $5 \times 6 = 30$

(c) $30 + 5 = 35$

So Janice concludes that 5 miles = 35 km and that she must run 35 km once a week (yikes!), what did Janice do wrong in her calculation?

Janice forgot to put a decimal between the 3 and the 0 in part b of her calculation. She should have $5 \times 0.6 = 3.0$. So then she should get $5 + 3.0 = 8.0$ and she should conclude that she must run 8.0 km once a week.