

## **Problems practice**

**This file contains over 600 math problems with full answers and explanations. Good luck on your test.**

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Bạn nên tải về chương trình EMATH từ website của chúng tôi để tìm hiểu thêm về các thuật ngữ toán học, cũng như các phương pháp giải toán nói chung.

1. If  $3X + 7 = 4$ , what is the value of  $(X - 2)^3$ ?

- (A) -81
- (B) -27
- (C) 0
- (D) 12
- (E) 27

The best answer is B.

Solve:  $3X + 7 = 4 \Rightarrow 3X = -3 \Rightarrow X = -1$ .

$(X - 2)^3 = (-3)^3 = -27$  and so answer B is correct.

2. A, B, C and D are all different digits between 0 and 9.

If  $AB + DC = 7B$  (AB, DC and 7B are double digit numbers), what is the value of C?

- (A) 0
- (B) 1
- (C) 2
- (D) 3
- (E) 5

The best answer is A.

Start adding from the right:  $B + C = B$  and so  $C = 0$  since it can't be 10, 20 or anything more than 9.

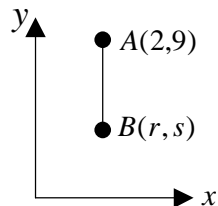
3. If  $3^7 = 9^{2T}$ , what is the value of T?

- (A) 0.5
- (B) 1.5
- (C) 1.75
- (D) 2.25
- (E) 2.5

The best answer is C.

$3^7 = 9^{2T} \Rightarrow 3^7 = (3^2)^{2T} \Rightarrow 7 = 4T \Rightarrow T = 7/4 = 1.75$ .

4.



In the figure above, if the line segment AB is perpendicular to the x-axis and has a length of 8, what is the value of  $s/r$  ?

- (A) 0.25
- (B) 0.5
- (C) 0
- (D) 1
- (E) 2

The best answer is B.

If the line has a length of 8 and it's parallel to the x-axis the coordinates of point B will be (2, 1) and so  $S=1$  and  $r=2$ .

The value of  $s/r = 1/2$ .

5. Everyday, Kevin divides \$180 equally across different charity organizations. On Sunday Kevin divided his money to 9 different organizations, while on Monday, he divided his money to only 7. How much more money (in dollars) did each organization receive on Monday than on Sunday?

- (A) 3.5
- (B)  $5\frac{5}{7}$
- (C)  $6\frac{2}{3}$
- (D) 7.5
- (E) 9

The best answer is B.

Calculate the amount that each organization received each day:

On Sunday:  $180/9 = \$20$ .

On Monday:  $180/7 = \$25\frac{5}{7}$ , which is larger by  $5\frac{5}{7}$  from Sunday and so B is the right answer.

6. The income of a doctor is X times larger than that of a teacher. If we'll cut 20% of the doctor's income and we'll increase the teacher's income by 20% their income will be even.  $X =$

- (A) 1.5
- (B) 2
- (C) 3
- (D) 2.5
- (E) 3.5

The best answer is A.

Let the doctors income be  $D$  and the teachers income be  $T$ .

The doctors' income after a decrease is equal to the teachers' income after

an increase:  $\frac{80}{100}D = \frac{120}{100}T \Rightarrow \frac{8D}{10} = \frac{12T}{10} \Rightarrow D = 1.5T$

And therefore  $X = 1.5$ .

7. Dorothy has 200 marbles. If 10% of the marbles are large and the rest are small, how many small marbles should Dorothy remove so the portion of the large marbles will be 20% of the total?

- (A) 40
- (B) 80
- (C) 100
- (D) 140
- (E) 150

The best answer is C.

10% of the marbles are big, thus 20 marbles. The rest ( $200 - 20 = 180$ ) are small. We want 20 marbles to be 20% of the total and so the total should be 100. In order for the total to be 100, 100 small marbles should be removed and so the right answer is C.

8. A giant wheel with a radius of  $\frac{130}{p}$ , breaks loose from its axis and starts rolling with out slipping on a flat surface. What is the distance that the wheel will cross after three complete revolutions?

- (A) 260
- (B) 540
- (C) 780
- (D) 1040
- (E) 2520

The best answer is C.

The circumference of the wheel is  $2pR = 2p \frac{130}{p} = 260$ .

After three whole revolutions, the wheel will cross a distance of  $260 \times 3 = 780$  and so C is the right answer.

9. For which of the following values of  $X$  will  $5X + 8$  be smaller than 14?

- (A) 4
- (B) 3
- (C) 2
- (D) 1.5
- (E) 1

The best answer is E.

We want  $5X + 8 < 14 \Rightarrow 5X < 6 \Rightarrow X < 6/5$  or  $X < 1.2$

The only number that answers these criteria's is answer E.

10. Which of the following numbers is smaller than  $1/7$  and larger than  $1/8$ ?

- (A) 0.2
- (B) 0.08
- (C) 0.13
- (D) 0.75
- (E) 0.12

The best answer is C.

One number between  $1/8$  and  $1/7$  is  $1/(7.5) = \frac{1}{7.5} = \frac{1}{15/2} = \frac{2}{15}$ .

$2/15$  is like  $20/150$ , which is approximately 0.133 and so C is the right answer.

11. If  $X \cdot Y < Y$  and both X and Y are integers, which of the following is true?

- (A)  $X = -Y$
- (B)  $X = -1$
- (C) X is positive
- (D) X is negative
- (E) X is a fraction

The best answer is D.

The first answer that pops into mind is that X is a fraction, but the question says that X is an integer. The only way that X makes Y smaller is if it is negative and so D is the right answer.

12. If  $\sqrt{2} \cdot \sqrt{3} \cdot \sqrt{5} \cdot \sqrt{X} = X$ , what is the value of X?

- (A) 5
- (B) 15
- (C) 30
- (D) 35
- (E) 45

The best answer is C.

$\sqrt{2} \cdot \sqrt{3} \cdot \sqrt{5} \cdot \sqrt{X} = X$  can be written as:  $\sqrt{2 \cdot 3 \cdot 5} \sqrt{X} = X$ . Divide both sides by  $\sqrt{X}$  to get:  $\sqrt{30} = \sqrt{X}$  and so  $X = 30$ .

13. If  $X$  is positive even number and  $Y$  is a positive odd number, which of the following expressions is *not* even?

- (A)  $(XY)^Y$
- (B)  $Y^2$
- (C)  $X^5$
- (D)  $Y^2X^3$
- (E)  $4Y$

The best answer is B.

Pick up random numbers for  $X$  and  $Y$ :  $X=2$  and  $Y=1$ .

The only odd answer is B,  $1^2 = 1$  and so this is the right answer.

14.  $A$ ,  $B$  and  $C$  are integers. If the expression  $A + B + C$  is even and the expression  $A - C$  is odd, which of the following can be said on  $B$ ?

- (A) odd
- (B) even
- (C) negative
- (D) positive
- (E) None of the above

The best answer is A.

Since  $A - C$  is odd,  $A + C$  is also odd (the sign doesn't matter).

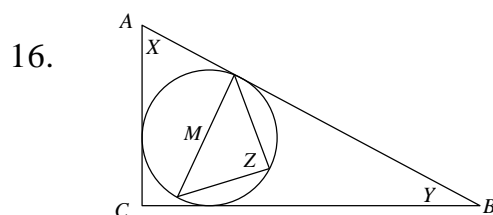
By adding  $B$  to  $A + C$ , the expression becomes even and therefore  $B$  must be also odd and so A is the right answer.

15. How many square feet of marble are needed to cover a rectangular floor that is 60 inches by 132 inches? (1 foot = 12 inches)

- (A) 32
- (B) 44
- (C) 55
- (D) 68
- (E) 75

The best answer is C.

The area that is needed to be covered is 60 on 132 inches, in feet its 60/12 on 132/12, which is 5 feet on 11 feet and so the area is 55 and the right answer is C.



If M is the diameter of the circle and ACB is a right triangle at C, what is the sum of  $X + Y + Z$  in degrees?

- (A) 90
- (B) 120
- (C) 180
- (D) 270
- (E) 360

The best answer is C.

Since M is the diameter of the circle, Z as the inscribed angle, is  $90^\circ$ .

The sum of the angles in the ABC is  $180^\circ$  and so  $X + Y + 90 = 180 \Rightarrow X + Y = 90$  and so  $X + Y + Z = 180^\circ$  and so C is the answer.

17. On a blueprint, 3 cm represent 125 meters. If a road is 437.5 meters, how many cm will represent it on the blueprint?

- (A) 5
- (B) 7.5
- (C) 9
- (D) 10.5
- (E) 12

The best answer is D.

$437.5 / 125 = 3.5$ . And therefore we should stick to the given proportion and just multiply 3.5 by 3 cm to get 10.5 cm on the blueprint.

18. If  $5^{3X+2} = 125$  and  $X^{2Y-1} = X^6$ , what is the value of  $Y/X$ ?

- (A) 8
- (B) 9.5
- (C) 10
- (D) 10.5
- (E) 11

The best answer is D.

$5^{3X+2} = 125 \Rightarrow 5^{3X+2} = 5^3$  and so  $3X + 2 = 3 \Rightarrow X = 1/3$ .

$X^{2Y-1} = X^6 \Rightarrow 2Y - 1 = 6 \Rightarrow Y = 7/2$ .

$Y/X = (7/2)/(1/3) = 10.5$ .

19. In Pillsbury Island the weather during a 30 day month is distributed as followed: 12 days of rain, 7 days of sunny weather and the rest of the

days have thunderstorms. When a randomly chosen tourist comes to the island, what is the probability that there would be thunderstorms?

- (A)  $6/15$
- (B)  $1/4$
- (C)  $3/4$
- (D)  $19/30$
- (E)  $11/30$

The best answer is E.

There are  $(30 - 12 - 7 = 11)$  days of thunderstorms in a month and so if a day is chosen at random, there is a probability of  $11/30$  that there'll be thunderstorms.

20. If the volume of a cube is 27, what is the shortest distance from the centre of the cube to one of its corners?

- (A)  $\sqrt{15}$
- (B)  $2\sqrt{3}$
- (C)  $\sqrt{27}$
- (D)  $\frac{3\sqrt{3}}{2}$
- (E)  $\frac{\sqrt{3}}{2}$

The best answer is D.

Draw a cube and also draw a line from its center to one of the corners. Use the Pythagoras principle to find the diagonal of the base of the cube. The volume is 27 and so each side is 3.

The diagonal of the base is  $\sqrt{3^2 + 3^2} = \sqrt{18}$ .

The diagonal of the cube is again calculated using the Pythagoras principle; this time with the height of the cube and the diagonal of the base:

The diagonal of the cube is  $\sqrt{18 + 3^2} = \sqrt{27}$ .

Half the diagonal is the shortest distance between the center and the corner and so the answer is  $\frac{\sqrt{27}}{2} = \frac{3\sqrt{3}}{2}$ .

21. When X is divided by 6, the remainder is 3. Which of the following represents the number that when is divided by 5 will yield a remainder of 3?

- (A)  $X + 1$
- (B)  $X + 2$
- (C)  $X + 3$
- (D)  $X + 4$
- (E)  $X + 5$



The best answer is D.

Pick a number for  $X$  and try the answers:  $X = 9$  and so when divided by 6, the remainder is 3.

Only  $(X + 4)$ , or in our case 13, when divided by 5, the remainder is 3 and therefore the right answer is D.

22. How many positive double-digit numbers are there where both the tens and the units' digits are prime numbers?

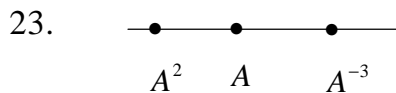
- (A) 15
- (B) 25
- (C) 35
- (D) 45
- (E) 55

The best answer is B.

The possible prime digits are: 1, 2, 3, 5 and 7.

The numbers that can be put together are: 11, 22, 33, 55, 77, 12, 13, 15, 17, 21, 23, 25, 27, 31, 32, 35, 37, 51, 52, 53, 57, 71, 72, 73 and 75.

Altogether we have 25 numbers and so the right answer is B.



If  $A^2$ ,  $A$  and  $A^{-3}$  lie on a number line in the order show in the figure above, which of the following can be a value of  $A$ ?

- (A) -4
- (B) -0.25
- (C) 0
- (D) 0.25
- (E) 2

The best answer is D.

The only way that  $A^2$  is smaller than  $A$  and that  $A^{-3}$  is larger than  $A$  is if  $A$  is a positive fraction.

Take answer D for example:  $A = 0.25$ .

$A^2 = 1/16$  and  $A^{-3} = 64$  and so this answer is good.

24. A snake crawled for three minutes. In the first minute the snake traveled 65 feet, which was 30% farther than it traveled in the second minute. In the third minute the snake traveled at a speed of 5 feet per second. What is the total distance that the snake traveled in feet?

- (A) 385
- (B) 415

- (C) 460
- (D) 500
- (E) 525

The best answer is B.

In the first minute it traveled 65 feet.

In the second minute it traveled X feet,  $X + 0.3X = 65 \Rightarrow X = 65/1.3 = 50$  feet. In the third minute it traveled  $(5 \times 60 = 300)$  feet.

The total distance is  $(65 + 50 + 300 = 415)$  feet.

25. Two birds are flying towards one another. The first bird is traveling at a speed of 40 mph, which is 25% faster than the second bird. If the distance between the birds is 20 miles, how long will it take the birds to meet

(In minutes)?

- (A) 35
- (B) 30
- (C) 25
- (D) 20
- (E) 15

The best answer is D.

The speed of the second bird is X,  $(X + 0.25X = 40) \Rightarrow$

$X = 40/1.25 = 32$  mph. In order to find the time it will take the birds to meet, divide the total distance by the sum of the bird's speeds:

$24 / (40+32) = 24/72 = 1/3$  hour, which is 20 minutes and so the best answer is D.

1. If  $5X + 7 + Y = 28$  and  $2X + Y = 0$ , what is the value of X?

- (A) -14
- (B) -7
- (C) 0
- (D) 7
- (E) 9

The best answer is D.

From the second equation,  $Y = -2X$ . Replace  $-2X$  with  $Y$  in the first equation to get the following:  $5X - 2X = 21 \Rightarrow 3X = 21 \Rightarrow X = 7$  and so D is the right answer.

2. If  $A + 2B = 50$  and  $B - 3A = 10$ , what is the value of  $(A + B)$ ?

- (A)  $-4/27$
- (B) -3
- (C) 0
- (D)  $7/120$
- (E)  $190/7$

The best answer is E.

From the second equation:  $B = 10 + 3A$ .

$A + 2B = 50 \Rightarrow A + 2(10 + 3A) = 50 \Rightarrow A + 20 + 6A = 50 \Rightarrow 7A = 30 \Rightarrow$

$A = 30/7$ . Plug A into one of the equations to get:  $B = 160/7$ .

$A + B = 30/7 + 160/7 = 190/7$  and so E is the answer.

3. If  $\frac{3X + 3Y}{16Y} = 2.5$  and  $\sqrt{4Y^2} + X = 12$ , what is the value of  $(Y - 2X)$ ?

- (A)  $4/3$
- (B)  $28/3$
- (C) -15
- (D)  $-17\frac{1}{3}$
- (E)  $-22\frac{1}{4}$

The best answer is D.

The first equation can be simplified to  $3X + 3Y = 24Y$  or  $X + Y = 8Y \Rightarrow X = 7Y$ .

The second equation can be simplified to  $2Y + X = 12$ .

Replace X with  $7Y$  in the second equation:  $2Y + 7Y = 12 \Rightarrow Y = 12/9 = 4/3$ .

$(Y - 2X) = (Y - 14Y) = -13Y = -13 \times 4/3 = -52/3 = -17$  and a third.

4. If it takes Jackson 24 minutes to eat two cheeseburgers by him self, how many minutes does it take him to eat half a cheeseburger?

- (A) 4 minutes
- (B) 6 minutes
- (C) 12 minutes

- (D) 14 minutes
- (E) 48 minutes

The best answer is B.

In two cheeseburgers there are 4 half's. It takes 24 minutes to eat 4 half's and so it will take  $(24/4 = 6)$  minutes to eat one half.

5. It takes Mandy 3 hours to bake 3 cakes while Sandy can do it in only 2.  
How long (in minutes) will it take Sandy and Mandy, working together, to bake 3 cakes?

- (A) 24
- (B) 45
- (C) 60
- (D) 72
- (E) 120

The best answer is D.

Each hour, Mandy bakes  $1/3$  of the job (baking 3 cakes) while Sandy finishes  $1/2$  of the job. Together, their combined power is  $1/3 + 1/2 = 5/6$ .

$1/(5/6) = 6/5$  is the time in hours it will take them to bake 3 cakes.

In minute, the time is  $6 \times 60 / 5 = 6 \times 12 = 72$  minutes.

6. If it takes 4 workers 5 hours to build 2 platforms, how many hours would it take 3 workers to build 3 platforms?

- (A) 6
- (B) 8
- (C) 10
- (D) 12
- (E) 14

The best answer is C.

$$Data \Rightarrow \frac{Work1}{Time1 \times Worker1} = \frac{Work2}{Time2 \times Worker2} \Leftarrow Question$$

$$Data \Rightarrow \frac{2}{5 \times 4} = \frac{3}{hours \times 3} \Leftarrow Question$$

⇒ Hours =  $5 \times 4 / 2 = 10$  hours.

7. If it takes 3 people 14 minutes to drink 2 liters of water, how many minutes will it take 2 people to drink 2.5 liters of water?

- (A) 24 minutes and 10 seconds
- (B) 25 minutes
- (C) 26 minutes and 15 seconds
- (D) 26 minutes and 25 seconds
- (E) 28 minutes and 25 seconds

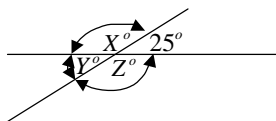
The best answer is C.

$$Data \Rightarrow \frac{Work1}{Time1 \times Worker1} = \frac{Work2}{Time2 \times Worker2} \Leftarrow Question$$

$$Data \Rightarrow \frac{2}{14 \times 3} = \frac{2.5}{\text{minutes} \times 2} \Leftarrow \text{Question}$$

minutes =  $(2.5 \times 14 \times 3) / (2 \times 2) = 105/4 = 26.25 = 26 \text{ minutes and } 15 \text{ seconds.}$

8.



Two lines intersect in the figure above. What is the value of  $Z + X - Y$ ?

- (A) 180
- (B) 225
- (C) 285
- (D) 310
- (E) 345

The best answer is C.

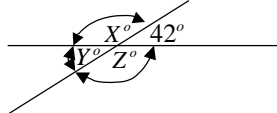
X and Z are vertical angles and therefore equal.

X and 25 are adjacent angles and so  $X = 180 - 25 = 155^\circ$ .

Y and 25 are vertical angles and therefore equal.

$Z + X - Y = 155 + 155 - 25 = 285^\circ$  and so C is the answer.

9.



Two lines intersect in the figure above. What is the value of  $2Z - 2Y$ ?

- (A)  $78^\circ$
- (B)  $112^\circ$
- (C)  $156^\circ$
- (D)  $192^\circ$
- (E)  $214^\circ$

The best answer is D.

X and Z are vertical angles and therefore equal.

X and 42 are adjacent angles and so  $X = 180 - 42 = 138^\circ$ .

Y and 42 are vertical angles and therefore equal.

$2Z - 2Y = 138 \times 2 - 42 \times 2 = 276 - 84 = 192^\circ$  and so D is the answer.

10. If  $3X + 17 = 373$ , what is the value of  $3X - 17$ ?

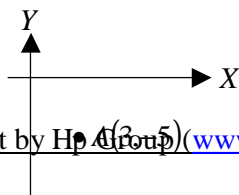
- (A) 356
- (B) 339
- (C) 313
- (D) 298
- (E) 273

The best answer is B.

Since  $3X + 17 = 373$ ,  $3X = 373 - 17 = 356$ .

$3X - 17 = 356 - 17 = 339$  and so B is the right answer.

11.



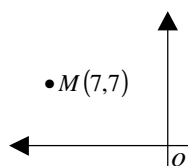
In the figure above, a line is to be drawn through point A so that it never crosses the Y-axis. Through which of the following points must the line pass?

- (A)  $(-3, -5)$
- (B)  $(-3, 5)$
- (C)  $(6, -5)$
- (D)  $(3, 5)$
- (E) Answers A and C.

The best answer is D.

We are told that the line crosses point A yet it never crosses the Y-axis, which means that its X coordinate is constant. Look among the answers for a point with the same X-coordinate, the only possible answer is D.

12.



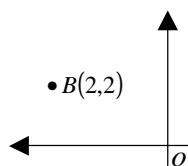
In the figure above, a line is to be drawn through points O and M. Through which of the following points must the line pass?

- (A)  $(1, 0)$
- (B)  $(0, 1)$
- (C)  $(5, 5)$
- (D)  $(10, 5)$
- (E)  $(5, 10)$

The best answer is C.

We are told that the line crosses point O and M and therefore it is in  $45^\circ$  relative to the X-axis and the Y-axis. Look through the answers for a coordinate that its X value is equal to its Y value. Only answer C fits this description and so this is the right answer.

13.



In the figure above, a line is to be drawn through point B so that it does cross point O.

Through which of the following points *can't* the line pass?

- (A)  $(1, 0)$

- (B) (0, 1)
- (C) (6, 6)
- (D) (10, 5)
- (E) (5, 10)

The best answer is C.

We are told that the line crosses point B and not O and therefore it is not in a  $45^\circ$  relative to the X-axis and the Y-axis. Look through the answers for a coordinate that its X value is equal to its Y value. Only answer C fits this description and so this is the right answer.

14. The ratio between 17.5 and 7 is equal to the ratio between 5 and what number?
- (A) 9.5
  - (B) 7
  - (C) 6.5
  - (D) 3
  - (E) 2

The best answer is E.

We can write the following relations:  $\frac{17.5}{7} = \frac{5}{X}$ , where X is the number we're looking for.  $X = \frac{5 \times 7}{17.5} = 2$  and so E is the best answer.

15. The ratio between 20 and 34 is equal to the ratio between 10 and what number?
- (A) 15
  - (B) 17
  - (C) 21
  - (D) 24
  - (E) 28

The best answer is B.

We can write the following relations:  $\frac{20}{34} = \frac{10}{N}$ , where N is the number we're looking for.  $N = \frac{34 \times 10}{20} = 17$  and so E is the best answer.

16. When X is deducted by 9, the result is 2 times X.
- X = ?
- (A) -9
  - (B) -6
  - (C) -3
  - (D) 0
  - (E) 9

The best answer is A.

Write an equation from the question above:  $X - 9 = 2X$   $\Rightarrow X = -9$  and so A is the right answer.

17. What number increased by 15 equals 4 times that number?

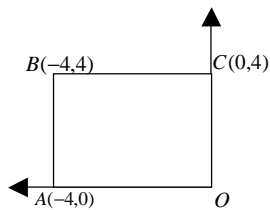
- (A) 3
- (B) 5
- (C) -3
- (D) -5
- (E) 0

The best answer is B.

Let the number we are looking for be X.

Write the following equation:  $X + 15 = 4X$   $\Rightarrow 3X = 15$   $\Rightarrow X = 5$  and so B is the answer.

18.



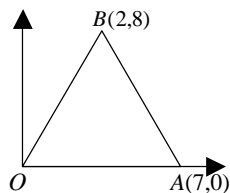
What is the area of the rectangle ABCO in the figure above?

- (A) 4
- (B) 8
- (C) 12
- (D) 16
- (E) 18

The best answer is D.

According to the coordinates of the rectangle, we know that one of the sides is equal to 4 and so is the other. The area of the rectangle is therefore  $4 \times 4 = 16$  and so D is the right answer.

19.



What is the area of the triangle OAB in the figure above?

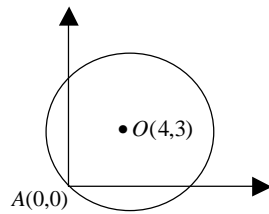
- (A) 22
- (B) 24
- (C) 26
- (D) 28
- (E) 30

The best answer is D.



The area of a triangle is determined by the multiplication of the base and the height divided by two. Using the coordinates, we can see that the base is 7 and the height is 8 and therefore the area of the triangle is  $7 \times 8 / 2 = 7 \times 4 = 28$ .

20.



O is the origin of the circle in the figure above. If the circle crosses point A, what is the area of the circle?

- (A)  $4p$
- (B)  $12p$
- (C)  $16p$
- (D)  $25p$
- (E)  $36p$

The best answer is

We need to find the radius of the circle. Draw an imaginary right triangle so that the hypotenuse is the line AO. We can see that the right triangle has the following sides: 3 and 4. Use the Pythagoras principle and find the line AO:  $AO = \sqrt{3^2 + 4^2} = \sqrt{25} = 5$ . Since the radius is 5, the area of the circle is  $p \cdot R^2 = p \cdot 5^2 = 25p$ .

21. The distance from Christy's home to school is 4.5 Km and the distance from Christy's school to work is 5.5 Km. Which of the following *could not* be the distance, in Km, from Christy's home to work?

- (A) 1
- (B) 3
- (C) 4.5
- (D) 9
- (E) 11

The best answer is E.

When we are given a distance, it is presumable that it's a straight line.

From home to school its 4.5 Km and from school to work its 5.5 Km.

The distance between school and work can be between  $(5.5 - 4.5 = 1 \text{ Km})$  and the sum of the two  $(5.5 + 4.5 = 10 \text{ Km})$ . The only answer that is not in that range is E, 11 Km.

22. Car A drives at an average speed of 15 mph. It takes car A, at average speed, 30 minutes to drive from point A to point B and 2 hours to drive from point B to point C. Which of the following could not be the distance, in miles, between point A and C?

- (A) 22.5
- (B) 25
- (C) 32
- (D) 35
- (E) 40

The best answer is E.

Distance = Time x speed.

The distance between A and B is  $15 \times 0.5 = 7.5$  miles.

The distance between B and C is  $15 \times 2 = 30$  miles.

The distance between A and C is between  $(30 - 7.5 = 22.5 \text{ miles})$  and  $(30 + 7.5 = 37.5 \text{ miles})$ , look for an answer that is not in that range.

E is the only answer that is out of the specified range.

23. Three quarters of a meter of fence are used for creating a fence box.

Which of the following lengths of fences, in meters, could be used to build a fence box with the least amount of remaining fence?

- (A)  $3/2$
- (B)  $1/2$
- (C)  $13/12$
- (D)  $5/4$
- (E)  $19/20$

The best answer is E.

We need only  $3/4$  of a meter in order to build the fence box. Look for the number which is closest (yet greater) than  $3/4$ .

All the answers but E are greater than 1 meter or smaller than  $3/4$  and therefore E is the best answer.  $19/20$  would leave only  $1/5$  meter of residue.

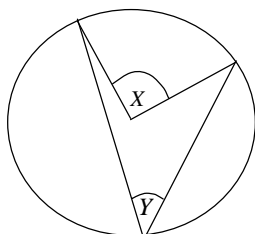
24. 1.5 meters squared of plywood are needed in order to build a desk. Which of the following plywood areas, in meters squared, could be used to build two desks with the least amount of remainders?

- (A)  $13/4$
- (B)  $10/3$
- (C)  $16/5$
- (D)  $19/6$
- (E)  $7/2$

The best answer is D.

We need 3 meters squared of plywood. Look among the answers for the number that is closest to 3 meters. The best answer is D;  $19/6 = 3$  and  $1/6$ .

25.



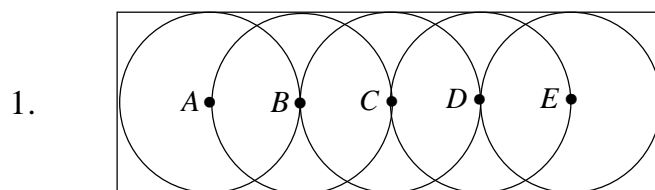
If X is equal to  $60^\circ$ , what is the value of the angle Y?

- (A)  $20^\circ$
- (B)  $30^\circ$
- (C)  $40^\circ$
- (D)  $50^\circ$
- (E)  $60^\circ$

The best answer is B.

Angle subtended by an arc at the center of a circle is double the angle subtended by the same arc on the circumference, therefore  $X = 2Y$ .

Since  $X = 60$ ,  $Y = 30^\circ$  and so B is the best answer.



In the figure above, A, B, C, D and E are centers of 5 circles.

If each of the circles has an area of 15, what is the area of the rectangle?

(A) 40

(B)  $60 + \frac{p}{15}$

(C)  $\frac{90}{p}$

(D)  $\frac{180}{p}$

(E)  $60 - \frac{15}{p}$

The best answer is D.

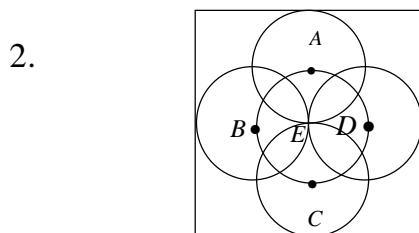
Each of the circles has an area of 15, which is equal to  $p \cdot R^2$ , and

therefore the radius of each of the circles is  $\sqrt{\frac{15}{p}}$ .

The area of the rectangle is the multiplication of its sides.

One side is equal to 2 radiuses of the circle and the other side is made from 6 radiuses. The area of the rectangle is  $(2R) \times (6R) = 12R^2$ , which is equal to

$12 \times \frac{15}{p} = \frac{180}{p}$  and so D is the answer.



In the figure above, A, B, C, D and E are 5 centers of the two circles. If each circle has an area of 2, what is the perimeter of the square?

(A) 256

(B)  $256 - \frac{2}{p}$

- (C)  $4\sqrt{\frac{2}{p}}$   
 (D)  $256 + \frac{p}{16}$   
 (E)  $\sqrt{\frac{512}{p}}$

The best answer is E.

Each of the circles has an area of 2, which is equal to  $p \cdot R^2$ , and therefore the radius of each of the circles is  $\sqrt{\frac{2}{p}}$ .

The perimeter of the square is 4 times the length of one side.

One side is equal to 4 radiuses of the circle. The perimeter of the square is

$(16) \times (R)$ , which is equal to  $16 \times \sqrt{\frac{2}{p}} = \sqrt{\frac{256 \cdot 2}{p}} = \sqrt{\frac{512}{p}}$  and so E is the answer.

3. There are 5 roads from city A to city B and 6 roads from city B to city C.

If Michael walks from city A to city C and back, passing through city B each time, and doesn't travel any road twice, how many different routes for the walking trip are possible?

- (A) 900  
 (B) 750  
 (C) 720  
 (D) 600  
 (E) 540

The best answer is D.

Let's go over each road at a time.

From A to B: there are 5 options.

From B to C: there are 6 options.

From C back to B: there are  $(6 - 1)$  options, thus 5.

From B back to A: there are  $(5 - 1)$  options, thus 4.

The number of possibilities is the multiplication of these numbers:

$5 \times 6 \times 5 \times 4 = 600$  possibilities and therefore the answer is D.

4. Linda has 12 shirts, 5 pants and 3 belts. If Linda wears one of each of the items, in how many different ways can she dress?

- (A) 160  
 (B) 175  
 (C) 180  
 (D) 190

(E) 200

The best answer is C.

The number of possibilities is actually the multiplication of the number of options in each item.

The number of possibilities is  $(12 \text{ shirts}) \times (5 \text{ pants}) \times (3 \text{ belts}) = 180$  combinations and so C is the answer.

5. If a jet airplane can travel 450 feet per second, how many yards can he fly in a quarter of a minute?

- (A) 1550
- (B) 1750
- (C) 1900
- (D) 2150
- (E) 2250

The best answer is E.

A quarter of a minute is 15 seconds.

In one second it flies 450 feet, which is 150 yards ( $1 \text{ yard} = 3 \text{ feet}$ ).

$(150 \text{ yards per second}) \times (15 \text{ seconds}) = 2250 \text{ yards}$ .

6. If a turtle travels 25 meters in half a minute, how much time would it take him to travel 20 meters, in seconds?

- (A) 21
- (B) 22
- (C) 23
- (D) 24
- (E) 25

The best answer is D.

The turtle can travel 25 meters in 30 seconds, which makes his rate  $25/30 = 5/6$  meters per second. It would take him  $(20) / (5/6) = 24$  seconds to travel 20 meters.

7. James just bought a ball from a local sports shop that sells only basketballs, soccer balls and bowling balls. Which of the following must be true?

- (A) The ball is a basketball
- (B) The ball is a bowling ball
- (C) The ball is not a leather basketball.
- (D) The ball is not a professional bowling ball
- (E) The ball is not a tennis ball

The best answer is E.

Since all the balls are either basketballs, soccer balls or bowling balls, the only answer that must be true is E since there are no tennis balls in the shop.

8. If  $P$  is an even prime number, what is the next greater prime number in terms of  $P$ ?

- (A)  $P + 3$
- (B)  $P - 1$
- (C)  $P + 1$
- (D)  $2P - 1$
- (E)  $2P + 3$

The best answer is C.

There is only one even prime number, 2.

The next greater prime number is 3, which is  $2 + 1$  and in terms of  $P$  it is  $P + 1$  and so the answer is C.

9. A certain pipe is divided evenly into 5 parts, each 4 feet and 2 inches. What is the length of the original pipe, in feet? (1 foot = 12 inches).

- (A)  $22\frac{2}{3}$
- (B)  $20\frac{5}{6}$
- (C)  $18\frac{3}{4}$
- (D)  $18\frac{1}{2}$
- (E)  $12\frac{1}{6}$

The best answer is B.

If one part is 4 feet and 2 inches, which is  $4\frac{1}{6}$  feet, the original length of the pipe should be  $5 \times 4\frac{1}{6} = 20\frac{5}{6}$  and so B is the answer.

10. Of the following numbers, which is the *least*?

- (A)  $\frac{3}{4} + \frac{1}{5}$
- (B)  $\frac{1}{2} - \frac{1}{3}$
- (C)  $\frac{1}{3} + \frac{1}{12}$

(D)  $\frac{1}{6} - \frac{1}{5}$

(E)  $1 - \frac{3}{4}$

The best answer is D.

All the answers apart from D are positive and we know that a negative number is smaller than a positive one and so the right answer must be D.

11. [1, 3, 6, 8, 9]

How many different pairs of unequal numbers can be chosen from the set above so that their multiplication is greater than 12? (Do not consider 1,3 and 3,1 as different pairs.)

(A) 6

(B) 8

(C) 12

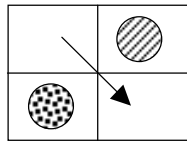
(D) 18

(E) 24

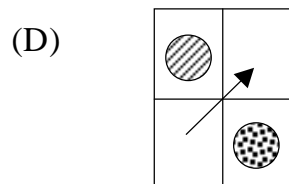
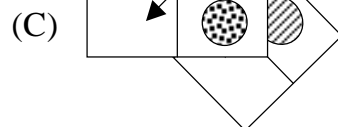
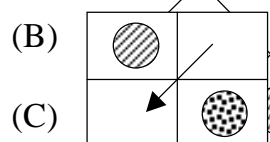
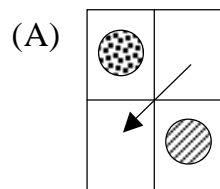
The best answer is A.

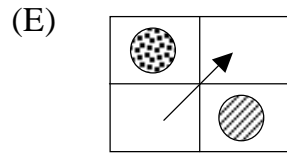
The following pairs answer the criteria: (3,6), (3,8), (3,9), (6,6), (6,8) and (6,9). The answer, therefore, is A.

12.



If the shape in the figure above is to be rotated by  $270^\circ$  around an axis that is found in the middle of the rectangle, which of the following represents the resulting circle?





The best answer is D.

Look at the shape as if it was a clock. The original figure is set, so the arrow points at the hour 5 approximately.

If you turn the arrow  $270^\circ$ , the arrow should point to the hour 1.

There are two probable choices: D and E.

Only D is good since the circles in E are not in the same orientations as they were in the original figure.

13. A printing machine can only work from 8:00 A.M. to 13:00 P.M. and from 16:00 P.M. to 20:00 P.M every day due to the noise. If it takes 4 minutes for a printing machine to print one newspaper, how many days would it take 2 machines to print 810 newspapers?

- (A) 1
- (B) 2
- (C) 3
- (D) 4
- (E) 5

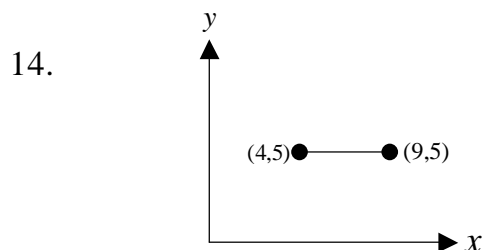
The best answer is C.

One printing machine can print  $(60 / 4 = 15)$  newspapers in one hour.

In one working day there are  $5 + 4 = 9$  hours.

One printing machine can print  $15 \times 9 = 135$  newspapers everyday.

Two machines can print 270 newspapers in one day and so it would take  $(810 / 270 = 3)$  days in order to complete the task.



In the figure above, the line segment joining the points (4,5) and (9,5) is the radius of a certain circle. Which of the following represents the circumference of the circle?

- (A)  $p \cdot 25$



- (B)  $p \cdot 4^2$
- (C)  $p \cdot 10$
- (D)  $p^2 \cdot 5^2$
- (E)  $p \cdot 5$

The best answer is C.

The length of the line segment is 5 according to the coordinates.

The circumference of a circle is calculated using  $2 \cdot p \cdot R$ , which in our case is equal to  $p \cdot 10$ .

15. Four brothers are to share a heritage of \$850,000 in the following ratio 1:2:3:4. What is the amount of the *greatest* share?

- (A) \$510,000
- (B) \$340,000
- (C) \$255,000
- (D) \$170,000
- (E) \$85,000

The best answer is B.

Find the share unit of heritage, thus  $(\$850,000) / (1 + 2 + 3 + 4) = \$85,000$ .

The greatest share was 4 units, or  $4 \times \$85,000 = \$340,000$  and so answer B is correct.

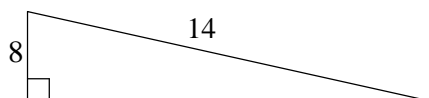
16. If X is a prime number, which of the following is a factor of 4X?

- (A)  $X^2$
- (B)  $2X$
- (C)  $3X$
- (D)  $11X$
- (E)  $12X$

The best answer is E.

Since X is a prime number, only if you multiply it by a number that is dividable by 4, the result would be a factor of 4X and so the only possible answer is E.

17.



In the figure above, what is the perimeter of the triangle?

- (A)  $2 \cdot \sqrt{65}$
- (B)  $4 \cdot \sqrt{65} + 22$

- (C)  $\sqrt{820}$
- (D)  $22 + 2 \cdot \sqrt{65}$
- (E) 32

The best answer is D.

First find, using the Pythagoras principle, the length of the missing side. Name the missing side M and write:  $M^2 = 14^2 - 8^2$  and so

$$M = \sqrt{14^2 - 8^2} = \sqrt{260} = \sqrt{4 \cdot 65} = 2 \cdot \sqrt{65}.$$

The perimeter of the triangle is therefore  $8 + 14 + 2 \cdot \sqrt{65} = 22 + 2 \cdot \sqrt{65}$  and so D is the right answer.

18. What is the least possible prime number for which 30% of that number is greater than 4.5?

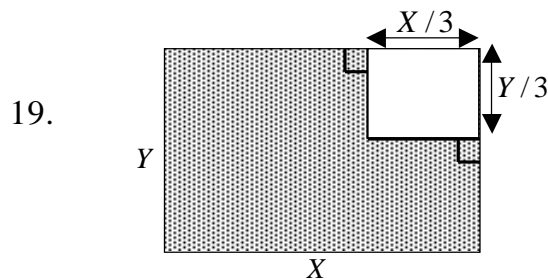
- (A) 11
- (B) 13
- (C) 17
- (D) 23
- (E) 27

The best answer is C.

Take 30% of each of the answers and see which one will result in a number that is greater than 4.5.

30% of 13 is  $3.9 < 4.5$

30% of 17 is  $5.1 > 4.5$  and so C is the right answer.



Which of the following is equal to the area of the shaded region above?

- (A)  $2XY$
- (B)  $X^2Y^2$
- (C)  $4XY/9$
- (D)  $8XY/9$
- (E)  $XY/9$

The best answer is D.

The area of the shaded region is equal to the area of the great rectangle minus the area of the white section.

The area of the entire rectangle is  $XY$  and the area of the white section is  $(X/3)(Y/3) = XY/9$ .

The area of the shaded region is therefore,  $XY - XY/9 = 8XY/9$  and so D is the answer.

20. If  $3R = 6 + P/3$ , then which of the following can be equal to  $R$  assuming that  $0 < P < 9$  ?

- (A)  $9/11$
- (B)  $45/13$
- (C)  $7/6$
- (D)  $20/7$
- (E)  $1/9$

The best answer is D.

From the question  $\Rightarrow R = 2 + P/9$ , and since  $P$  is a positive number smaller than 9,  $P/9$  is a fraction and so  $R$  is between 2 and 3.

Look among the answers for a number that is between 2 and 3, the only possible answer is of course D;  $20/7 = 2\frac{6}{7}$ .

21. Subtract 7 from  $Y$ , divide the result by 6, multiply everything by 2 and add 11 to this quotient.

Which of the following is the possible result obtained by performing the operations described above?

- (A)  $\frac{Y-33}{3}$
- (B)  $Y/3+12$
- (C)  $\frac{Y+26}{3}$
- (D)  $\frac{40-Y}{6}$
- (E)  $Y+7$

The best answer is C.

Do the following one step at a time:

$Y - 7 \leq \frac{Y-7}{6} \leq \frac{Y-7}{3} \leq \frac{Y-7}{3} + 11 \leq \frac{Y-7+33}{3} = \frac{Y+26}{3}$  and so C is the answer.

22. If the ratio between X and Y is 3:7, which of the following could represent X and Y?

- (A) X=4, Y=36
- (B) X=4, Y= $9\frac{1}{3}$
- (C) X=7, Y=3
- (D) X=1.5, Y=3
- (E) X=0, Y=14

The best answer is B.

The ratio should be 3:7 and so if we divide Y by X, the result should be

$7/3 = 2.5$ . Take answer B:  $9\frac{1}{3}/4 = \frac{28}{3}/4 = \frac{28}{12} = 2.5$  and so this is the right answer.

23. A barrel with a radius of R feet is rolling down a slope.

If the barrel rolled a distance of S yards, how many complete revolutions did it make? (1 yard = 3 feet)

- (A)  $\frac{3S}{R \cdot p \cdot 2}$
- (B)  $\frac{6}{R \cdot S \cdot p}$
- (C)  $\frac{4R}{3 \cdot S \cdot p}$
- (D)  $\frac{S}{3 \cdot 2 \cdot p \cdot R}$
- (E)  $\frac{p \cdot R}{3 \cdot S}$

The best answer is A.

The distance that the barrel rolled is 2S feet.

When the barrel travels  $2 \cdot p \cdot R$ , it completes one revolution.

And therefore the barrel completed  $\frac{3S}{R \cdot p \cdot 2}$  revolutions.

24. Two sisters went shopping, the bigger sister spent Y dollars and the smaller sister spent X dollars. If the difference between the two expenses is equal to their average, what is the value of the expression  $(X/Y)^2$ ?

- (A) 2

(B) 3

(C) 6

(D) 9

(E) The answer cannot be determined from the information given

The best answer is D.

If the difference is equal to the average, then we could write the equation:

$$X - Y = (X + Y)/2.$$

$\Rightarrow X - 3Y = 0 \Rightarrow X/Y = 3 \Rightarrow (X/Y)^2 = 9$  and so the answer is D.

25. If X is a positive even number, Y is a positive odd number ( $X > Y$ ) and

$Z = X - Y$ , which of the following expressions must be *even*?

(A)  $(XZ)^2$

(B)  $(XY)^Z$

(C)  $Y^Z$

(D)  $Z^Y$

(E)  $Z^4$

The best answer is B.

In these types of questions it is easy to pick up numbers.

For example:  $X=2$ ,  $Y=1$  and  $Z = 2 - 1 = 1$ .

Check out all the answers, B is equal to  $2^1 = 2$  and so this is the right answer.

1. If  $A = 0.2B$ ,  $B = 6C$  and  $C = 0.6D$ , what is the value of A when  $D = 70$ ?

(A) 40.8

(B) 45.5

(C) 48.2

(D) 50.4

(E) 62.2

The best answer is D.

$A = 0.2(6(0.6(70))) = 0.2 \times 6 \times 0.6 \times 70 = 0.72 \times 70 = 50.4$  and so D is the right answer.

2. The center of a certain circle with a radius of 5 is located at  $O(0,0)$ . Which of the following points is located on the circumference of the circle?

(A) (2, 3)

(B) (-5, 5)

- (C) (5, 5)
- (D) (3, 4)
- (E) (0, 10)

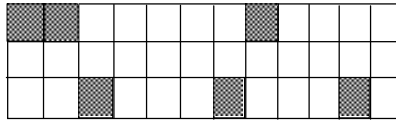
The best answer is D.

Only coordinate (3, 4) is located on the circumference of the circle.

Draw an axis system with the relevant point.

Complete the point to a triangle with the following coordinates: (3,0) and (0,0) so that the hypotenuse is equal to  $\sqrt{3^2+4^2} = 5$  and so this point is located on a circle with a radius of 5.

3.



The rectangle in the figure above is divided into equal squares. What percent of the rectangle is shaded?

- (A)  $16\frac{2}{3}\%$
- (B) 22%
- (C)  $25\frac{1}{3}\%$
- (D) 32.5%
- (E)  $40\frac{2}{5}\%$

The best answer is A.

There are  $12 \times 3 = 36$  identical squares in the figure above.

We can count that 6 of them are shaded and therefore  $1/6$  of the rectangle is shaded.  $1/6$  in percent terms is  $16\frac{2}{3}\%$  and so A is the right answer.

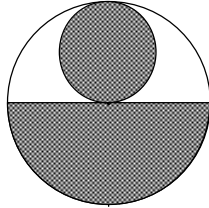
4. If X and Y are positive integers, which of the following expressions is equivalent to  $\frac{(5^X)^{2Y}}{5^X}$ ?

- (A)  $5^{2Y}$
- (B)  $5^{(XY)/X}$
- (C) 5
- (D)  $5^{2XY-X}$
- (E)  $X^{5Y}$

The best answer is D.

$\frac{(5^x)^{2Y}}{5^x}$  can be simplified to  $\frac{5^{2XY}}{5^x}$ , which is equal to  $5^{2XY-x}$  and therefore D is the right answer.

5.



The ratio between the radii of the small circle to that of the large one is 1:2.

If the radius of the small circle is  $\sqrt{\frac{2}{p}}$ , what is the area of the white region?

- (A) 2
- (B) 3
- (C) 6
- (D) 8
- (E) 12

The best answer is A.

The radius of the large circle is therefore  $2 \times \sqrt{\frac{2}{p}} = \sqrt{\frac{8}{p}}$ .

The area of the small circle is  $p \cdot R^2 = p \cdot \frac{2}{p} = 2$  and in the same way the radius of the large circle 8.

The area of the white region is equal to  $8 - 4 - 2 = 2$  and so A is the right answer.

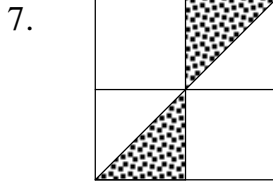
6. If  $X + 2X + 3X + 4X + 5 = Y + 2Y + 3Y + 4Y + 6$ , what is the value of  $(X - Y)$ ?

- (A) 0.01
- (B) 0.1
- (C) 1
- (D) 10
- (E) 100

The best answer is B.

Simplify the expression in the question:

$$10X + 5 = 10Y + 6 \Rightarrow 10X - 10Y = 1 \Rightarrow 10(X - Y) = 1 \Rightarrow X - Y = 0.1.$$



Approximately what percent of the square is dotted?

- (A) 5%
- (B) 15%
- (C) 25%
- (D) 35%
- (E) 45%

The best answer is C.

There are two dotted triangles in the figure above out of eight in total. The question didn't mention that the figure is not drawn into scale and so we can presume that the percent of the dotted area is  $\frac{2}{8} = \frac{1}{4}$ , which is 25%.

8. Which of the following fractions is greater than 0.35?

- (A)  $\frac{1}{3}$
- (B)  $\frac{1}{6}$
- (C)  $\frac{2}{7}$
- (D)  $\frac{2}{5}$
- (E)  $\frac{1}{8}$

The best answer is D.

Another way of solving this question is to find the largest fraction, which must be greater than 0.35 anyway.

$\frac{2}{5}$  is the largest fraction and therefore D is the right answer.

9. Paul is taller than Mike but shorter than Rick. If P, M and R represent each of their height, respectively, which of the following is true?

- (A)  $R < P < M$
- (B)  $M < P < R$
- (C)  $P < M < R$
- (D)  $R < M < P$
- (E)  $P < R < M$

The best answer is B.

Translate words into inequalities:

Paul is taller than Mike:  $P > M$

But shorter (Paul) than Rick:  $R > P$ .

And therefore B is the answer,  $R > P > M$ .



10. Travis had  $X$  items to sell at an average price of  $Y$  dollars per item. If Travis didn't sell  $Z$  items, which of the following represents the total cents amount he received from the sales?

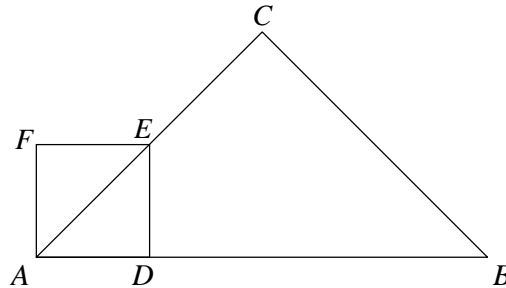
- (A)  $Y(X - Z)$
- (B)  $Z(Y - X)$
- (C)  $(100 - Z)XY$
- (D)  $100Y(X - Z)$
- (E)  $(Z - X)/(100Y)$

The best answer is D.

The amount of items that Travis sold is  $(X - Z)$ .

If each item costs  $Y$  dollars, which is 100 cents, Travis sold  $100Y(X - Z)$  and so D is the right answer.

11.



In the figure above,  $E$  is the middle point of side  $AC$  of the equilateral triangle  $ABC$ . If the perimeter of the triangle is  $18\sqrt{2}$ , what is the perimeter of the square  $ADEF$ ?

- (A)  $6\sqrt{2}$
- (B) 4
- (C) 12
- (D)  $12\sqrt{2}$
- (E) 16

The best answer is C.

The perimeter of the triangle is  $18\sqrt{2}$  and so each of its sides is  $6\sqrt{2}$ .

Since  $E$  is the middle point of side  $AC$ ,  $AE = 3\sqrt{2}$ , which is the diagonal of the square. The ratio between the diagonal of a square to its sides is  $\sqrt{2}:1$  and so each of the sides is equal to 3.

The perimeter of the square is therefore  $3 \times 4 = 12$ .

12. A clown holds X balls, one on top of the other, on the palm of his hand. The radius of each of the balls is 3.5 inches and the palm of the clown's hand is 2 feet off the ground.

If the tip of the highest ball is extended up to 45 inches,  $X = ?$

(1 foot = 12 inches)

- (A) 3
- (B) 4
- (C) 5
- (D) 6
- (E) 7

The best answer is A.

The palm of his hand is 2 feet off the ground, which is 24 inches.

The rest of the distance is filled with X balls that extend to an area of  $(45 - 24 = 21)$  inches) and so all we need to calculate is how many balls can fit in 21 inches.

The radius of each ball is 3.5 inches and so the diameter is 7 inches.

Divide 21 by 7 to get the number of balls that fit in the spacing:  $21/7 = 3$  balls.

13. The average (arithmetic mean) of 5 numbers is 7. When a sixth number is added, the average of the 6 numbers is 100. What is the sixth number?

- (A) 560
- (B) 565
- (C) 570
- (D) 575
- (E) 580

The best answer is B.

Let X be the sixth number.

Use the average formula,  $\frac{5 \cdot 7 + X}{6} = 100 \Rightarrow 35 + X = 600 \Rightarrow X = 565$  and

so B is the right answer.

14. The remainder of 343 by 16 is divided by 3, resulting in a remainder of which of the following numbers?

- (A) 1
- (B) 2
- (C) 3
- (D) 4
- (E) 5

The best answer is A.

343 divided by 16 is 21 with a remainder of 7.

When dividing 7 by 3, the result is 2 with a remainder of 1 and so the best answer is A.

15. When 145 is divided by 32, the remainder is X, and when 145 is divided by 22, the remainder is Y. What is the value of  $Y/X$ ?

- (A)  $5/7$
- (B)  $12/17$
- (C)  $17/13$
- (D)  $6/11$
- (E)  $13/17$

The best answer is E.

When dividing 145 by 32, the result is 4 with a remainder of 17.

When dividing 145 by 22, the result is 6 with a remainder of 13.

The answer is therefore  $13/17$  and so E is the right answer.

16. The expression  $(7 \times 7^5)$  is how many times greater than 49?

- (A) 6
- (B) 7
- (C) 15
- (D)  $7^4$
- (E)  $7^5$

The best answer is D.

49 is actually  $7^2$  and  $7 \times 7^5$  is equal to  $7^6$ .

$7^6$  is equal to  $7^4 \times 7^2$  and so the right answer is D.

17. In a certain club, only white and black beer is served.

Eight of the club's members drink white beer and twenty two drink black.

If six of the members that drink black beer also drink white beer, how many members are in the club?

- (A) 6
- (B) 8
- (C) 22
- (D) 24
- (E) 26

The best answer is C.

8 club members drink white beer.

22 club members drink black beer, and 6 of them also belong to the group that drinks white beer. By adding the amount of people in each group and subtracting the overlapping, the total number of member is the result.

The answer is  $22 + 8 - 6 = 24$ .

18. In A sack of potatoes,  $\frac{1}{3}$  of the potatoes are small,  $\frac{1}{4}$  of them are medium sized, and  $\frac{1}{6}$  of them are large. If the remaining 12 potatoes are huge, what is the number of small and medium sized potatoes in the sack?

- (A) 12
- (B) 16
- (C) 22
- (D) 28
- (E) 48

The best answer is D.

Find out what part of the sack is made of huge potatoes:

$1 - \frac{1}{3} - \frac{1}{4} - \frac{1}{6} = \frac{1}{4}$  and therefore a quarter of the potatoes are huge and so there are  $4 \times 12 = 48$  potatoes in the sack.

We are to find how many small and medium sized potatoes are there in the sack, which is  $(\frac{1}{3} + \frac{1}{4}) \times 48 = \frac{7}{12} \times 48 = 28$  potatoes.

19. If  $A + 15 < 28$  and  $B + 5 > 14$ , which of the following answers can be the value of  $A - B$  ?

- (A) 1
- (B) 3
- (C) 5
- (D) 7
- (E) 12

The best answer is A.

Simplify the expressions:  $A + 15 < 28 \Rightarrow A < 13$  and  $B + 5 > 14 \Rightarrow B > 9$

If we take  $A = 12$  and  $B = 11$ ,  $A - B = 1$  and so A will be a good answer.

20. If 1 cubic inches of magma weighs 2 pounds, how much will 3 cubic feet of magma weighs, in pounds?

(1 cubic feet = 1728 cubic inches)

- (A) 5,184
- (B) 6,874
- (C) 8,222
- (D) 10,368
- (E) 12524

The best answer is D.

3 cubic feet are  $3 \times 1728 = 5184$  cubic inches.

Each of those cubic inches weighs 2 pounds and so 5184 cubic inches will weigh  $2 \times 5184 = 10,368$  pounds.

21. In a certain class there are  $R$  rows,  $T$  desks in each row and  $C$  chairs on every desk. If  $P$  amount of paint is to be divided equally amongst each of the chairs, how much paint will each chair receive?

- (A)  $PR/(TC)$
- (B)  $TC/(PR)$
- (C)  $P/(TCR)$
- (D)  $R/(TCP)$
- (E)  $CPR/T$

The best answer is C.

First, find the number of chairs in the class:

The number of chairs is  $R \times T \times C$ .

Each chair receives an equal amount of paint and so by dividing  $P$  by the number of chairs we'll get the amount of paint per chair and so the right answer is  $P/(RTC)$ .

22. The ratio between A, B, C and D is 3:4:5:12 respectively.

If  $C = 15$ , what is the value of  $A + D$  ?

- (A) 12
- (B) 24
- (C) 28
- (D) 36
- (E) 45

The best answer is E.

The ratio between C and A is 5:3 respectively and if  $C=15$ ,  $A=9$ .

The ratio between C and D is 5:12 respectively and if  $C=15$ ,  $A=36$ .

$A + D$  is therefore equal to  $9 + 36 = 45$  and so E is the right answer.

23. If  $X < 0$  and  $Y < Z$ , which of the following is true?

- I.  $Z - X < Y - X$
- II.  $Y + X < Z + X$
- III.  $YX > ZX$

- (A) Statement 1 only
- (B) Statement 2 only
- (C) Statements 1 and 2 only
- (D) Statements 2 and 3 only
- (E) Statements 1, 2 and 3 only

The best answer is D.

I. Add  $X$  to both sides to get  $Z < Y$ , which is not true.

II. Subtract  $X$  from both sides to get  $Y < Z$ , which is true.

III. Divide both sides by  $X$  to get:  $Y < Z$ , which is true and so D is the right answer.

24. Given the formula  $X = X^2(Y - 2Z)$ , then  $Z =$

- (A)  $(2X)/(XY - 1)$
- (B)  $(1 - XY)/(2X)$
- (C)  $(2 - 2XY)/(X)$
- (D)  $(YX - 1)/(2X)$
- (E)  $(XY - 1)/2$

The best answer is D.

Simplify the equation:

$X = X^2(Y - 2Z)$ , divide both sides by  $X$  to get:

$1 = X(Y - 2Z) \Rightarrow 1 = XY - 2XZ \Rightarrow 2XZ = XY - 1 \Rightarrow$

$Z = (XY - 1)/(2X)$  and so D is the right answer.

25. In the series 2, 4, 8, 14, 22,... the 7<sup>th</sup> term is

- (A) 40
- (B) 41
- (C) 42
- (D) 43
- (E) 44

The best answer is E.

Find the pattern in the given series.

We can see that the difference between the terms is growing by 2 each time.

From 2 to 4 its 2, from 4 to 8 its 4, from 8 to 14 its 6, from 14 to 22 its 8 and then  $22 + 10$  is 32 and  $32 + 12 = 44$  and so the right answer is E.

1. The total weight of John and his brother is 180 kilograms. If John's weight is 15 Kilograms more than half of his brothers weight, what is the differences between their weights?

- (A) 25
- (B) 30
- (C) 40
- (D) 50

(E) 70

The best answer is C.

Let J be the weight of John and B the weight of his brother.

We can write the following two equations:

$$J + B = 180 \text{ and } J = 15 + B/2.$$

$$\Rightarrow 15 + B/2 + B = 180 \Rightarrow 3B/2 = 165 \Rightarrow B = \frac{165 \cdot 2}{3} = 110 \text{ Kg and so } J = 70 \text{ Kg. The differences between their weights is } (110 - 70 = 40 \text{ Kg}).$$

2. Bill and Ted have \$25,000 together. If Bill has 5 thousand dollars more than 3 times the money Ted has, how much money does Ted have?

- (A) \$5,000
- (B) \$8,500
- (C) \$10,000
- (D) \$12,500
- (E) \$20,000

The best answer is A.

Let B the money Bill has and T the money Ted has.

We can write the following equations:

$$B + T = 25,000 \text{ and } B = 5,000 + 3T \Rightarrow 5,000 + 3T + T = 25,000 \Rightarrow 4T = 20,000 \Rightarrow T = \$5,000 \text{ and so } B = \$20,000. \\ \text{Ted has } \$5,000.$$

3. If  $X \neq 0$ , what is the value of  $\frac{X \times 7}{\frac{147}{2X}}$ ?

- (A)  $\frac{21}{X^2}$
- (B)  $2X^2$
- (C)  $\frac{X^2}{21}$
- (D)  $\frac{21X^2}{2}$
- (E)  $\frac{2X^2}{21}$

The best answer is E.

$$\frac{X \times 7}{\frac{147}{2X}} = \frac{7X \cdot 2X}{147} = \frac{7X \cdot 2X}{49 \cdot 3} = \frac{2X^2}{7 \cdot 3} = \frac{2X^2}{21}.$$

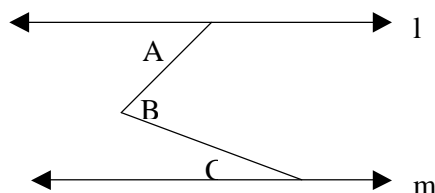
4. What is the value of  $\left(\frac{X}{Y}\right)^{-2}$ ?

- (A)  $X^2/Y^2$
- (B)  $X/Y$
- (C)  $X^2Y^2$
- (D)  $Y^2/X^{-2}$
- (E)  $X^{-2}Y^2$

The best answer is E.

$\left(\frac{X}{Y}\right)^{-2} = \left(\frac{Y}{X}\right)^2 = \left(\frac{Y^2}{X^2}\right) = X^{-2}Y^2$  and so E is the answer.

5.



In the figure above, A, B and C are three angles as drawn. M and l are parallel lines.

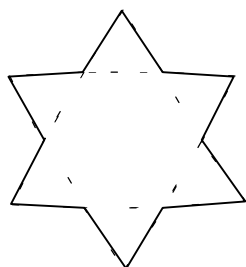
What is the value of the expression  $(A + C - B)$ ?

- (A)  $0^\circ$
- (B)  $5^\circ$
- (C)  $45^\circ$
- (D)  $90^\circ$
- (E) The answer cannot be determined from the given data

The best answer is A.

The easiest way to see that  $A + C = B$  is to draw another parallel line that crosses the angle B. The upper angle that the line forms is equal to A and the lower angle is equal to C, both complete the angle B.

6.



Five equilateral triangles were attached to a regular hexagon.

If the side of the hexagon is 5, what is the length of the outer perimeter of the shaped that was formed?



- (A) 25
- (B) 35
- (C) 50
- (D) 60
- (E) 75

The best answer is D.

Since the triangles are equilaterals, each of their side is equal to the hexagon's side. The total perimeter of the shaped that was formed is made up of 12 sides, thus  $12 \times 5$  is the length. Therefore the answer is D, 60.

7. If X and Y are integers and  $|X \cdot Y| < Y$ , what must be true?

- I. X is negative
- II. Y is positive
- III. X is a fraction

- (A) 1 only
- (B) 2 only
- (C) 3 only
- (D) 1 and 2
- (E) 2 and 3

The best answer is E.

Since Y is greater than an absolute value, it must be positive and so 2 is true.

Inside the absolute value, X makes Y smaller and therefore X is a fraction.

1 and 2 are correct and therefore the answer is E.

8. If X and Y are integers and  $\frac{X}{Y} < \left| \frac{X}{Y} \right| < Y$ , what must be true?

- I. X is negative
- II. Y is positive
- III. X/Y is negative

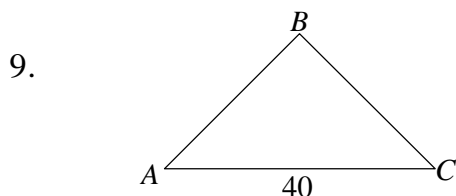
- (A) 1 only
- (B) 2 only
- (C) 3 only
- (D) 2 and 3
- (E) 1, 2 and 3

The best answer is E.

Since Y is greater than an absolute value, it must be positive and so 2 is true.

If an absolute value of a number is greater than the number itself, the number is negative and so 3 is also true.

Since  $X/Y$  is negative and Y is positive, X must be negative and so all three claims must be true.



The triangle in the figure above is an isosceles ( $AB = BC$ ).

If the area of the triangle is 100, what is the length of side BC?

(A)  $7\sqrt{5}$

(B) 12.5

(C)  $5\sqrt{17}$

(D) 16

(E)  $12\sqrt{15}$

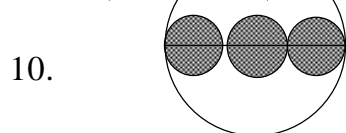
The best answer is C.

The area is simply the base multiplied by the height and divided by two.

$$100 = \frac{40 \cdot H}{2} \rightarrow H = 5.$$

BC can be calculated using the Pythagoras principle:  $BC^2 = 20^2 + 5^2$  è

$BC = \sqrt{400 + 25} = \sqrt{425} = \sqrt{25 \cdot 17} = 5\sqrt{17}$  and so C is the correct answer.



In the figure above, three identical triangles with a radius of R are

blocked inside a larger circle. What is the area of the larger circle using R?

(A)  $24R^2$

(B)  $12pR^2$

(C)  $36pR^4$

(D)  $24pR^2$

(E)  $36pR^2$

The best answer is E.

The radius of the larger circle is made up of 6 small radiuses.

The area of a circle is  $p \cdot r^2$ , which in our case is equal to  $p \cdot (6R)^2 = 36pR^2$ .

11. If  $(A - 3)(A + 7) - (A + 2)(A + 10) = 12$ , what is the value of A?

- (A) -5.5
- (B)  $-6\frac{5}{8}$
- (C)  $-8\frac{1}{3}$
- (D) -10.5
- (E)  $-12\frac{3}{4}$

The best answer is B.

Open the parenthesis and find the value of A.

$$A^2 + 7A - 3A - 21 - (A^2 + 2A + 10A + 20) = -8A - 41 = 12 \Rightarrow 8A = -53$$

$$A = -53/8 = -6\frac{5}{8} \text{ and so B is the correct answer.}$$

12. If  $2X < Y$  and  $2X^2 > XY$ , which of the following must be true?

- (A)  $X > 1$
- (B)  $X < 0$
- (C)  $X > 0$
- (D)  $Y < 0$
- (E)  $Y > 1$

The best answer is B.

We know that  $2X < Y$ , after multiplying both sides by X the sign of the inequality changed and therefore X must be negative and B is the answer.

13. If  $5X + 8 < \frac{12X - 3}{4}$ , which of the following must be true?

- (A)  $X > 12$
- (B)  $X > 1$
- (C)  $X < -12$
- (D)  $X < -4$
- (E)  $-6 < X < 6$

The best answer is D.

$$\text{Simplify the expression given: } 5X + 8 < \frac{12X - 3}{4} \Rightarrow 20X + 32 < 12X - 3 \Rightarrow$$

$$8X < -35 \Rightarrow X < -35/8, \text{ which is approximately } -4.4.$$

Since X is smaller than -4.4, it must also be smaller than -4.

Therefore the answer is D.

14. If  $0 < Y < 0.25$  and  $YR = 20$ , which of the following must be true?

- (A)  $R > 80$
- (B)  $0.2 < R < 5$
- (C)  $0.25 < R < 20$

- (D)  $0 < R < 1$
- (E)  $-2 < R < 8$

The best answer is A.

Pick a value for Y, for example  $Y = 0.2$ .

Input this value into the second equation:  $0.2R = 20 \Rightarrow R = 100$  and therefore the only answer that includes this range is A.

15. The first number in a sequence is -8 and every term after the first is 6 more than the term preceding it. What is the value of the 102'st term?

- (A) 598
- (B) 606
- (C) 600
- (D) 592
- (E) 608

The best answer is A.

If the sequence started in 0, the 102 number in the sequence would simply be

$101 \times 6 = 606$ . Since the first number wasn't zero, it was -8 the whole series of numbers is smaller by that number and therefore the answer is  $(606 - 8 = 598)$ .

16. In a certain class, the average height is 5 feet and 2 inches. Which of the following *must* be true?

- I. The tallest member in the classroom must be at least taller by an inch than the shortest member in the class.
- II. If there are 20 members in the class, the sum of the class members' heights is approximately 340 inches.
- III. If there is a 5 feet tall member in the class, there also must be a 5 feet and 4 inches member.

- (A) None
- (B) 1 only
- (C) 2 only
- (D) 3 only
- (E) 2 and 3

The best answer is C.

All the members can be the same height and so 1 doesn't have to be true. The sum is the average multiplied by the number of people and in our case

The sum is 5 feet and 2 inches (which is 17 inches)  $\times 20 = 340$  inches and so this statement is good.

3 doesn't have to be true since the distribution around the average doesn't divide equally by pairs of people.

We can see that only 2 is true and so C is the answer.

17. The price of a car was  $X$  pounds in February. If the price reduces by 20% each month, what will the price be in May?

- (A)  $0.4X$
- (B)  $0.6X$
- (C)  $0.64X$
- (D)  $0.512X$
- (E)  $0.4096X$

The best answer is D.

This question can be solved easier by choosing numbers.

Let say that the price in February was 100 ( $X = 100$  pounds).

In March, the price reduced by 20% to ( $0.8 \times 100 = 80$ ).

In April, the price reduced again by 20% to ( $0.8 \times 80 = 64$ ).

In May, the price reduced again by 20% to ( $0.8 \times 64 = 51.2$ ).

51.2 is  $0.512X$  and so the answer is D.

18. The value of a certain stock was  $Q$  dollars on Sunday.

If on Monday the price increased by 10% and on Tuesday it decreased by 10%, what is the value of the stock at the end of Tuesday?

- (A)  $Q$
- (B)  $0.99Q$
- (C)  $1.1Q$
- (D)  $1.01Q$
- (E)  $1.21Q$

The best answer is B.

Pick a number for  $Q$ , for example \$100.

On Monday, the value increased by 10% to 110.

On Tuesday, the value decreased by 10% to ( $0.9 \times 110 = \$99$ ).

And therefore the value is not  $Q$ , its  $0.99Q$  and so B is the right answer.

19. If  $X$  is an integer and  $X^5 = 243$ , what is the value of  $X$ ?

- (A) 1
- (B) 2
- (C) 3
- (D) 4
- (E) 5

The best answer is C.

Use the answers. Take 2 for example,  $2^5 = 32$  and so this is not the answer.

It can't be 4 or 5 since the units digit is 3 and therefore the answer must be 3 and really  $3^5 = 81 \times 3 = 243$ .

20. 5 ice-creams are sold for \$2.30 and 3 snack bars are sold for \$1.65. What will be Tim's change if he purchases 15 ice-creams and 6 snack bars using a hundred dollar bill?

- (A) \$92.80
- (B) \$91.20
- (C) \$89.80
- (D) \$55.60
- (E) \$50.40

The best answer is C.

15 ice-creams cost  $3 \times 2.30 = \$6.90$ .

6 snack bars cost  $2 \times 1.65 = \$3.30$ .

The total price is  $6.90 + 3.30 = \$10.20$ .

Tim paid with a \$100 bill and therefore his change was  $(100 - 10.20 = \$89.80)$ .

21. The price of soda can is 42 cents. If you buy 73 cans using a \$50 bill, how much change should you expect?

- (A) \$30.66
- (B) \$28.54
- (C) \$22.12
- (D) \$19.34
- (E) \$16.84

The best answer is D.

One soda can costs 42 cents and so 73 cans will cost  $(73 \times 42 = 3066$  cents), which is \$30.66. If we pay using a \$50 bill, the change will be  $(50 - 30.66 = \$19.34)$  and so D is the answer.

22. D is the midpoint of line segment AB and C is the midpoint of line segment DB. If the length of AB is 42, what is the length of AC?

- (A) 45
- (B) 42.5
- (C) 38.25
- (D) 34
- (E) 31.5

The best answer is E.

Draw the line and mark A, B, C and D.

AC is made up of two segments: AD and DC.

D is the midpoint of AB and therefore it is equal to 21.

$DC + CB = 21$  and  $DC = CB \Rightarrow DC = 10.5$

$AC = 21 + 10.5 = 31.5$ .

23. If  $A + C = 2B$ , what is the value of  $\frac{B-A}{B-C}$ ? ( $A > B > C$ )

- (A) 0.
- (B) 1.
- (C)  $-A$ .
- (D)  $C + A$ .
- (E)  $-1$ .

The best answer is E.

Simplify the expression:  $\frac{B-A}{B-C} = \frac{B-(2B-C)}{B-C} = \frac{-(B-C)}{B-C} = -1$ .

Therefore the answer is E.

24. Steve has 7 more than 4 times the number of posters that Sanders has. If  $2X$  represents the number of Steve's posters and if  $2Y$  represents the number of Sanders posters, which of the following is a correct expression relation  $X$  and  $Y$ ?

- (A)  $X = 2Y + 7$
- (B)  $X = 4Y + 7$
- (C)  $X = 4Y + 3.5$
- (D)  $X = 2Y + 3.5$
- (E)  $X = 4(Y + 7)$

The best answer is C.

According to the question, Steve has 7 more than 4 times the number of posters. In other words,  $2X = 4(2Y) + 7 \Rightarrow X = 4Y + 3.5$  and so C is the correct answer.

25. In the repeating decimal  $3.\overline{13579}$

The digits 13579 are repeated,  $3.135791357913579\dots$

Which digit is in the 1,999<sup>th</sup> place to the right of the decimal point?

- (A) 1
- (B) 3
- (C) 5
- (D) 7
- (E) 9

The best answer is D.

Every 5<sup>th</sup> digit is always 9 and therefore the 2,000<sup>th</sup> digit will be 9.

The 1,999<sup>th</sup> digit is one to the left of 9, which is 7 and so the answer is D.

1. If  $X + X/3 + X/4 = Y + Y/3 + Y/4$  and  $Y = 60$ , what is the value of  $X$ ?

- (A) 14.5
- (B) 16
- (C) 20
- (D) 45
- (E) 60

The best answer is E.

Replace  $Y$  with 60 and solve:

$X + X/3 + X/4 = 60 + 60/3 + 60/4 = 60 + 20 + 15 = 95$   $\Rightarrow$  multiply both sides by 12 to get:  $12X + 4X + 3X = 95 \times 12 = 1140$   $\Rightarrow$   $19X = 1140$   $\Rightarrow$   $X = 60$ .

2. The price of 15 books is \$45. If the price of 8 tapes and 4 books is \$44, what is the price of one tape?

- (A) 3
- (B) 4
- (C) 5
- (D) 6
- (E) 7

The best answer is B.

15 books cost \$45 and therefore one book costs \$3.

$8(\text{tapes}) + 4(3) = \$44 \Rightarrow 8(\text{tapes}) = \$32 \Rightarrow$  The price of a tape is \$4.

3. Tom is three times older than Shelly. If in three years Tom would be twice as old as Shelly, how old is Shelly today?



- (A) 3
- (B) 4
- (C) 6
- (D) 9
- (E) 12

The best answer is A.

Let T be the age of tom today and S the age of Shelly.

We can write the following equations:  $T = 3S$  and  $(T + 3) = 2(S + 3)$   $\Rightarrow$   
 $3S + 3 = 2S + 6 \Rightarrow S = 3$  and so the correct answer is A.

4. How many double-digit numbers are there where the product of their digits is 8?

- (A) 1
- (B) 2
- (C) 3
- (D) 4
- (E) 5

The best answer is D.

Since there aren't so many numbers, write them all: 18, 24, 42 and 81 and so the right answer is D.

5. How many odd double-digit numbers, which the sum of their digits is 6, exist?

- (A) 1
- (B) 3
- (C) 5
- (D) 7
- (E) 9

The best answer is B.

Since there aren't many numbers, write them all down:

15, 33 and 51 and so B is the right answer.

6.

Inches	Centimeters
7	17.78
X	53.34

Using the following conversion table, what is the value of X?

- (A) 14

- (B) 17
- (C) 21
- (D) 28
- (E) 30

The best answer is C.

Since  $17.78 \times 3 = 53.34$ ,  $X = 7 \times 3$  using the same ratio.

C is the correct answer.

7. The product of two odd integers is between 304 and 337 exclusive.  
Which of the following cannot be one of the integers?

- (A) 5
- (B) 13
- (C) 35
- (D) 39
- (E) 43

The best answer is E.

If the number is too big, for example 43, multiplying it with another odd integer wouldn't be in the specified range.

$43 \times 7 = 301$ , which is under the range.

$43 \times 9 = 387$ , which is over the range and therefore 43 cannot be one of the integers.

8. If the average of 6 consecutive numbers is X, what is the average of the two median numbers?

- (A)  $X/2$
- (B)  $X/3$
- (C)  $X - 1$
- (D) X
- (E)  $X + 1$

The best answer is D.

Since the numbers are consecutive, the average of the two middle numbers is the average of all the numbers. Take 1, 2, 3, 4, 5 and 6 for example:

The average is 3.5, now take 3 and 4; their average is also 3.5.

In our case the average stays X.

9. If  $X$  and  $Y$  are different positive integers and  $3X + Y = 14$ , what is the product of all the possible values of  $X$ ?

- (A) 6
- (B) 8
- (C) 14
- (D) 20
- (E) 24

The best answer is E.

Start from the first number:

$X=1$  ⇒ not possible.

$X=2$  ⇒  $Y=8$ .

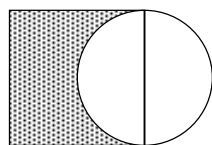
$X=3$  ⇒  $Y=5$ .

$X=4$  ⇒  $Y=2$ .

$X=5$  ⇒ not possible.

The product is therefore  $2 \times 3 \times 4 = 24$ .

10.



In the figure above, one side of the square is overlapping with the diameter of the circle. If the radius of the circle is 2, which of the following is the best approximation for the area of the shaded region?

- (A) 5
- (B) 10
- (C) 15
- (D) 20
- (E) 25

The best answer is B.

The area of the shaded region is derived from the area of the square minus half the area of the circle.

The area of the square is  $4 \times 4 = 16$ .

The area of the circle is  $p \cdot R^2 = p \cdot 4 \cong 12.6$  and so half the area would be 6.3.

The area of the shaded region would be approximately  $16 - 6.3 = 9.7$  and so B is the closest answer.

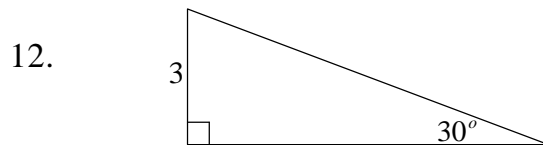
11. If  $\frac{Q}{99} = \frac{12}{11}$ , what is the value of  $Q$ ?

- (A) 98
- (B) 104

- (C) 108
- (D) 112
- (E) 118

The best answer is C.

Cross multiply the expression to get  $11Q = 12 \times 99$ . Divide both sides by 11 to get:  $Q = 12 \times 9 = 108$  and so C is the right answer.



What is the perimeter of the triangle in the figure above?

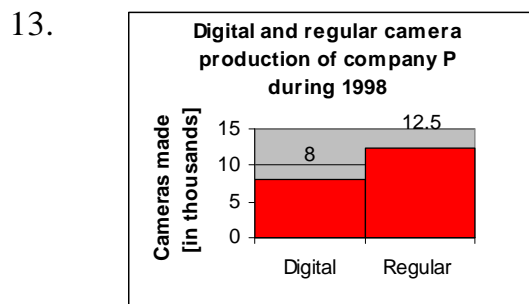
- (A)  $\sqrt{3} + 6$
- (B)  $3(3 + \sqrt{3})$
- (C)  $6\sqrt{3}$
- (D) 9
- (E) The data specified is insufficient

The best answer is B.

This is a special right triangle, its sides are in the ratio of  $1:2:\sqrt{3}$ .

Since the small side is 3, the second side is 6 and the third side is  $3\sqrt{3}$ .

The perimeter of the triangle is therefore  $3+6+3\sqrt{3} = 3(3 + \sqrt{3})$ .



According to the chart above, how many more regular cameras than digital cameras were produced by company P during 1998?

- (A) 2,000
- (B) 2,500
- (C) 3,200
- (D) 4,500
- (E) 5,200

The best answer is D.

According to the graph 12.5 thousand regular cameras were made and 8 thousand digital cameras, the difference is 4.5 thousand and so D is the right answer.

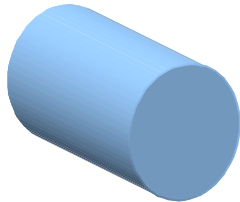
14. A certain lottery requires guessing 75% of the numbers to win. If the lottery contains 60 numbers, how many numbers should one guess in order to win?

- (A) 30
- (B) 35
- (C) 40
- (D) 45
- (E) 50

The best answer D.

In order to win the lottery, one should guess 75% of 60, which is  $60 \times \frac{3}{4} = 45$  numbers and so the right answer is D.

15.



If in the cylinder above, the radius is equal to  $\frac{2}{\sqrt{p}}$  and the height is 3, what is the volume of the cylinder?

- (A) 4
- (B) 6
- (C) 8
- (D) 12
- (E) 16

The best answer is D.

The volume of a cylinder is received by  $p \cdot R^2 \cdot h$ , which in our case is

$$p \cdot \left( \frac{2}{\sqrt{p}} \right)^2 \cdot 3 = 4 \cdot 3 = 12 \text{ and so D is the right answer.}$$

16. If X and Y are coordinates, which of the following pairs (X,Y) answer these conditions:  $X > Y + 2$  and  $X < 7$  ?

- (A) (4, 5)
- (B) (7, 3)
- (C) (6, 4)

- (D) (5, 1)
- (E) (3, 7)

The best answer is D.

Look among the answers for two things: X smaller than 7 and X bigger than Y. Take answer D:  $5 > 1 + 2$  and  $5 < 7$  and therefore this is the right answer.

17. If  $X = 2X/Y$ , then  $2Y =$

- (A) 1
- (B) 2
- (C) 3
- (D) 4
- (E) 5

The best answer is D.

Solve:  $X = 2X/Y$ , divide by X to get:  $1 = 2/Y \Rightarrow Y=2$  and so  $2Y = 4$ .

18. If  $X + 2Y = 6$  and  $Y = 3 - X/2$ , what is the value of  $(X + Y)$ ?

- (A) 4
- (B) 6
- (C) 8.5
- (D) 10
- (E) The answer cannot be determined

The best answer is E.

The second equation can be written as  $2Y = 6 - X$ , which is equal to the first equation and so we have two variables with only one equation and so more sufficient data is required.

19. If 20% of the liquids in the barrel are X liters and 45% of the liquids are Y liters, which of the following must be true?

- (A)  $X = 15$
- (B)  $X = Y - 20$
- (C)  $4Y = 9X$
- (D)  $X + 30 < Y$
- (E) None of the answers above are true

The best answer is C.

Lets say that there are 100 liters of liquid in the barrel.

$X = 20\%$ , which is 20 liters and  $Y = 45$  liters.

$4 \times 45 = 180$  liters and so is  $9 \times 20$  and so  $4Y = 9X$  and C is the right answer.

20. In how many ways can 5 kids be chosen out of a group of 6 kids?

- (A) 15
- (B) 8
- (C) 10
- (D) 6
- (E) 5

The best answer is D.

When you pick 5 kids one is left out and so picking out 5 is equal to picking out 1 kid. There are 6 combinations of picking up one kid and so the right answer is D.

21. The probability of giving birth to a boy or a girl is equal.

What is the probability of receiving 2 girls and a boy (not necessarily in that order)?

- (A)  $1/8$
- (B)  $1/2$
- (C)  $3/8$
- (D)  $1/4$
- (E)  $3/4$

The best answer is C.

Since there are two possibilities in every birth, boy or girl, the number of possibilities in 3 births is  $2 \times 2 \times 2 = 8$ .

There are three possible combinations: girl, girl, boy or girl, boy, girl or boy, girl, girl and therefore the probability is  $3/8$ .

22. A chopper travels 5 miles in 2 minutes, what is its speed in mph?

- (A) 80
- (B) 110
- (C) 120
- (D) 150
- (E) 180

The best answer is D.

In one hour there are 60 minutes or 30 2 minutes intervals.

In every 2 minute interval, the chopper travels 5 miles and so in 30 intervals it will travel  $30 \times 5 = 150$  miles and its speed would be 15 mph.

23. An agama walks for 5 hours at a rate of 2 mph and 5 additional hours at a rate of 10 mph. What is the agama average speed in mph?

- (A) 3

- (B) 6
- (C) 9
- (D) 12
- (E) 15

The best answer is B.

Use the regular average formula and calculate the average rate.

The average speed is therefore  $\frac{5 \cdot 2 + 5 \cdot 10}{10} = 6$  mph and so the right answer is B.

24. If Johnson can run 20 km in one hour, how many km can he run in 24 minutes?

- (A) 6
- (B) 8
- (C) 12
- (D) 14
- (E) 16

The best answer is B.

Johnson can run 20 km in one hour, which is 20 km in 60 minutes or 1 km in 3 minutes. In 24 minutes there are 8 3 minutes intervals and so B is the right answer.

25. George can finish a certain job in 8 days and Jerry can finish it in 12 days. How many days would it take them to complete the job together?

- (A) 6
- (B) 7
- (C)  $24/5$
- (D)  $30/7$
- (E)  $34/11$

The best answer is C.

George can finish 3 jobs in 24 days ( $24/8 = 3$ ).

Jerry can finish 2 jobs in 24 days ( $24/12 = 2$ ).

Together they can finish ( $2+3=5$ ) jobs in 24 days and so it would take them  $24/5$  days to finish one job and so the right answer is C.

1. If  $Y^3 + 23 = 777$ , what is the value of  $Y^3 - 23$ ?

- (A) 689
- (B) 711



- (C) 725
- (D) 731
- (E) 754

The best answer is D.

Solve:  $Y^3 + 23 = 777 \Rightarrow Y^3 = 777 - 23 = 754$  and so  
 $Y^3 - 23 = 754 - 23 = 731$  and the right answer is D.

2. If X, Y and Z are different positive integers, where  $XY = 21$  and  $ZY = 49$ , which of the following must be true?

- (A)  $X > Y > Z$
- (B)  $Y > Z > X$
- (C)  $Z > X > Y$
- (D)  $Z > Y > X$
- (E)  $Y > X > Z$

The best answer is C.

$XY = 21$ : There are a few options for X and Y, 1, 3, 7 and 21.

$ZY = 49$ : Z and Y can both be 7 or one of them is 1 and the other is 49.

Since all the integers are different, there is only one option:  $X=21$ ,  $Y=1$  and  $Z=49$  and so  $Z > X > Y$  and C is the right answer.

3. 70 hamburgers were sold during the last hour.

If 30% of the first 30 were sold with cheese, 50% of the next 20 were sold with out cheese and 10% of the rest were also sold with cheese, how many hamburgers were sold with cheese during the last hour?

- (A) 16
- (B) 18
- (C) 21
- (D) 24
- (E) 28

The best answer is C.

25% of 30 are with cheese, which is  $0.3 \times 30 = 9$ .

50% of 20 are with out cheese, which are 10.

10% of 20 are with cheese, which are 2.

In total, there are  $9 + 10 + 2 = 21$  hamburgers with cheeses.

4. If  $\langle X \rangle = (X - 2)^2 + X$ , what is the value of  $\langle -3 \rangle$ ?

- (A) 8
- (B) -10
- (C) -20
- (D) -28
- (E) 22

The best answer is E.

Use the template in the question to calculate  $< -3 >$ .

Replace X with -3:  $(-3 - 2)^2 - 3 = 25 - 3 = 22$  and so the right answer is E.

5. For  $X, Y > 0$ ,  $X \& Y = Y^2/X$ .

$$(1\&2)\&4 =$$

- (A) 4
- (B)  $\frac{1}{4}$
- (C)  $\frac{1}{3}$
- (D)  $\frac{1}{16}$
- (E)  $\frac{1}{64}$

The best answer is A.

Calculate the inner parenthesis first,  $1\&2 = 2^2/1 = 4$ .

$4\&4 = 4^2/4 = 4$  and so A is the right answer.

6. The sum of X and Y is 684. If X is divided by 8 the result is Y.

What is the value of Y?

- (A) 76
- (B) 82
- (C) 95
- (D) 100
- (E) 118

The best answer is A.

Write the following equations:  $X + Y = 684$  and  $X/8 = Y$ .

Replace X with 8Y:  $8Y + Y = 684 \Rightarrow Y = 684/9 = 76$ .

7. A photocopying machine has two programs:

- 1) Unlimited number of copies for \$15 per month
- 2) A basic charge of \$12 per month and 10 cents extra for each copy

From which number of copies is it profitable to use the first program rather than the second?

- (A) 11
- (B) 12
- (C) 30
- (D) 31
- (E) 51

The best answer is D.

If we copy 31 copies, it would cost \$15 using the first program and \$12 plus  $(0.1 \times 30 = \$3) = \$15$  in the second program and therefore copying one more copy would make the first program worthwhile since it would stay on \$15 while the second program would jump to \$15.1.

The answer is 31 copies.

8. If the difference between B and  $1/7$  is equal to the difference between  $1/6$  and  $1/8$ , what can be the value of B?

- (A)  $1/32$
- (B)  $4/13$
- (C)  $9/24$
- (D)  $21/131$
- (E)  $31/168$

The best answer is E.

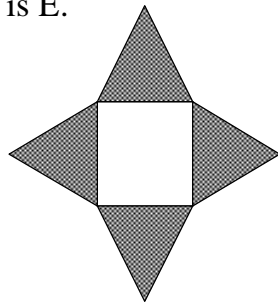
The difference between  $1/6$  and  $1/8$  is  $(1/6 - 1/8 = 1/24)$ .

One option is adding this difference to  $1/7$  and the other is to subtract.

Start with the first option:  $1/7 + 1/24 = \frac{24+7}{24 \cdot 7} = \frac{31}{168}$  and so the right

answer is E.

9.



Four equilateral triangles are placed on a square.

If the area of the square is 16 inches squared, what is the ratio between the area of the shaded region to the area of the square?

- (A)  $2: \sqrt{3}$
- (B)  $\sqrt{3}:1$
- (C)  $16\sqrt{3}:12$
- (D)  $2\sqrt{5}:5$
- (E)  $4\sqrt{3}:1$

The best answer is B.

If the area of the square is 16 then the side of the square, which is also the side of the triangle is equal to 4 inches. The height of each of the triangles

is  $\sqrt{4^2 - 2^2} = 2\sqrt{3}$  and therefore the area is  $\frac{4 \cdot 2\sqrt{3}}{2} = 4\sqrt{3}$ . The area of 4 triangles will be  $16\sqrt{3}$ .  
The ratio is  $16\sqrt{3}:16$  or  $\sqrt{3}:1$ .

10. The value of car in 1998 was \$50,000 and after three years it dropped to \$25,600. If the value, each year, is always the same fraction of the value reached on the previous year, what is this fraction?

- (A)  $\frac{1}{2}$
- (B)  $\frac{1}{3}$
- (C)  $\frac{5}{6}$
- (D)  $\frac{4}{5}$
- (E)  $\frac{5}{8}$

The best answer is D.

The right answer is D, every year the value dropped by 20%:

In 1998:  $\frac{4}{5} \times 50,000 = 40,000$

In 1999:  $\frac{4}{5} \times 40,000 = 32,000$

In 2000:  $\frac{4}{5} \times 32,000 = 25,600$ .

11. If  $X = 0.0Y$  (Y is a digit), what is the value of  $(3/Z)$  if  $Z = (X/Y)^2$ ?

- (A) 0.0003
- (B) 0.3
- (C) 30
- (D) 3,000
- (E) 30,000

The best answer is E.

Start from the end of the question.

$X/Y = 0.01 \Rightarrow (X/Y)^2 = 0.0001$ , which is also equal to Z.

$1/Z$  would be 10,000 and so  $3/Z$  would be 30,000.

12. If X percent of  $2X$  are equal to  $5X$ ,  $X =$

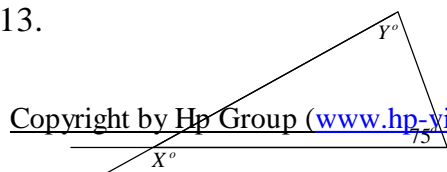
- (A) 50
- (B) 100
- (C) 150
- (D) 200
- (E) 250

The best answer is E.

Translate the words into a proper equation:  $\frac{X}{100} \cdot 2X = 5X \Rightarrow$

$2X^2 = 500X \Rightarrow X = 250$  and so E is the right answer.

13.



Assuming that  $X = 123^\circ$ , what is the value of  $Y$ , in degrees?

- (A) 36
- (B) 48
- (C) 56
- (D) 65
- (E) 72

The best answer is B.

The third angle in the triangle and  $X$  are adjacent angles and therefore it is equal to  $(180 - 123 = 57 \text{ degrees})$ .

The sum of the angles in the triangle is  $180^\circ$  and so we could write the following equation:  $75 + 57 + Y = 180 \Rightarrow Y = 48^\circ$  and so B is the right answer.

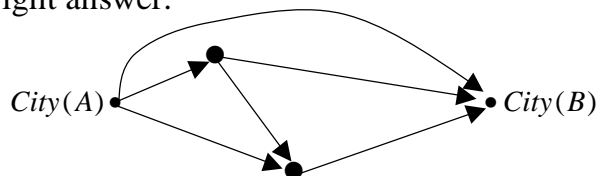
14. A new curtain costs 1 dollar per foot. If Mark needs 2100 mm of curtain, approximately how much should he pay in dollars assuming that 1 foot is 304.8 mm?

- (A) 7
- (B) 12
- (C) 15
- (D) 23
- (E) 29

The best answer is A.

2100 mm of curtain are approximately  $(2100/304.8 = \text{a little less than } 7)$  and so Mark needs 7 feet of curtain, which will cost him 7 dollars and so A is the right answer.

15.



The figure above represents the only roads from city A to city B.

If any path must follow the direction of the arrow, how many different paths are there from city A to city B?

- (A) 1
- (B) 2
- (C) 3

- (D) 4
- (E) 5

The best answer is D.

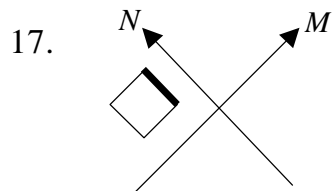
Follow the lines, there are only 4 different possible paths and so the right answer is D.

16. What is the least number of 7's that should be added together to yield a number greater than 220?

- (A) 14
- (B) 23
- (C) 27
- (D) 31
- (E) 32

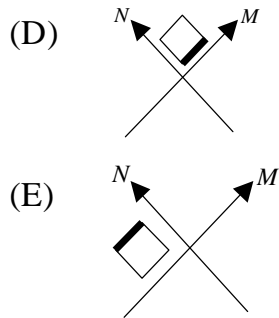
The best answer is E.

Add 31 7's, the result would be  $31 \times 7 = 217$  and so by adding just one more the sum would be greater than 220 and so the right answer is E.



The shape in the figure above is to be reflected across the M-axis and then across the N-axis. Which of the following shows the final position of the shape?

- (A)
- (B)
- (C)



The best answer is A.

A reflection means a mirror view.

After reflection it across the M-axis, the shape simply rotates counter clockwise  $90^\circ$  and after the second reflection, the shape rotates another  $90^\circ$  and turns around. The shape that is derived is A.

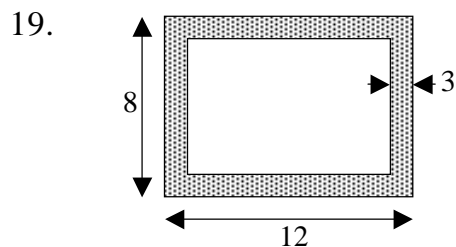
18. If X, Y, Z and W are consecutive numbers and  $X < Y < Z < W$ , what is the value of  $4W - 2Y - 2X$  ?

- (A) 2
- (B)  $4X$
- (C) 6
- (D)  $5X$
- (E) 10

The best answer is E.

Since the numbers are consecutive,  $Y = X + 1$ ,  $Z = X + 2$  and  $W = X + 3$ .

$4W - 2Y - 2X = 4(X + 3) - 2(X + 1) - 2X = 12 - 2 = 10$  and so the right answer is E.



What is the area of the shaded region above?

- (A) 48

- (B) 56
- (C) 72
- (D) 84
- (E) 96

The best answer is D.

The area is derived by subtracting the smaller inner rectangle from the area of the outer one.

The area of the outer rectangle is  $12 \times 8 = 96$ .

The area of the inner rectangle is  $(12 - 6) \times (8 - 6) = 6 \times 2 = 12$ .

The area of the shaded region is therefore  $96 - 12 = 84$ .

20. Two kittens start walking simultaneously in different direction. The speed of the first kitten is 4 meters per second and the speed of the second kitten is 2 meters per second. How many meters did the first kitten travel until the distance between the two kittens was 90 meters?

- (A) 30
- (B) 60
- (C) 90
- (D) 120
- (E) 180

The best answer is B.

The two kittens are traveling away from each other at a constant speed of  $(4 + 2 = 6)$  meters per second. In order for the distance between them to be 90 meters, 15 seconds should go by  $(90/6 = 15)$ .

After 15 seconds, the first kitten will travel  $15 \times 6 = 60$  meters.

21. Jill and Jack started walking in different direction at 17:00 from the same point. If Jack travels at a rate of 3 miles per hour and Jill travels at a rate of 1.5 miles per hour, how far would they be from one another at 19:30, in miles?

- (A) 9
- (B) 11.25
- (C) 12.5
- (D) 13.75
- (E) 14

The best answer is B.

The distance between Jack and Jill is growing at a rate of  $(1.5 + 3 = 4.5)$  miles per hour. 19:30 is 2.5 hours after 17:00 and so they managed to travel

$2.5 \times 4.5 = 11.25$  miles.



22. From two places, distanced 200 miles away, two cars started traveling at the same time towards one another. The slow car travels at a speed of 10 mph. If the two cars met after 5 hours, what is the speed of the faster car, in mph?

- (A) 30
- (B) 32
- (C) 34
- (D) 38
- (E) 42

The best answer is A.

Since the cars met after 5 hours, the slow car traveled 50 miles out of 200 and therefore the faster car traveled 150 miles in 5 hours.

Speed = distance/time and so speed =  $150/5 = 30$  mph.

23. Y miles are X inches in the city map.

How many inches on the map would represent  $(Y + 2)$  miles?

- (A)  $X + 2$
- (B)  $Y/X + 2$
- (C)  $X/Y + 2$
- (D)  $(Y + 2)X/Y$
- (E)  $(Y + 2)Y/X$

The best answer is D.

One mile would be represented by  $X/Y$  inches on the map.

$Y + 2$  miles would be represented by multiplying  $(Y + 2)$  with  $X/Y$  and therefore D is the right answer.

24. If  $6^{2P} = 12X$ , which of the following would represent  $2X$  in terms of P?

- (A)  $6^{2P-1}$
- (B)  $6^{P-1}$
- (C)  $2P + 1$
- (D)  $6/(2P - 1)$
- (E)  $6^{1-2P}$

The best answer is A.

$2X$  is simply  $12X/6$ , which is also equal to  $6^{2P} / 6$ .

$6^{2P} / 6 = 6^{2P} \times 6^{-1} = 6^{2P-1}$  and therefore A is the right answer.

25. X and Y are both double digit numbers. If in each, the tens digit is greater by 3 than the tens digit, what is the greatest possible difference between X and Y?

- (A) 33
- (B) 55
- (C) 66
- (D) 77
- (E) 82

The best answer is C.

Let's pick the largest and the smallest numbers: 96 and 30.

The difference between them is therefore  $(96 - 30 = 66)$  and so C is the right answer.

1. If  $2A + 4B = 15$  and  $A = -B$ , then  $3B =$

- (A) 15
- (B) 17.5
- (C) 22.5
- (D) 25
- (E) 27.5

The best answer is C.

Replace A with  $-B$ :  $-2B + 4B = 15 \Rightarrow 2B = 15 \Rightarrow B = 7.5$ .

And therefore  $3B = 7.5 \times 3 = 22.5$ .

2. If  $(X + Y)^2 = Z + 2$ ,  $X^2 + Y^2 = 10$  and  $XY = 3$ , what is the value of Z?

- (A) 10
- (B) 12
- (C) 14
- (D) 16
- (E) 18

The best answer is C.

$(X + Y)^2 = X^2 + 2XY + Y^2 = 10 + 2 \times 3 = Z + 2 \Rightarrow 16 = Z + 2 \Rightarrow Z = 14$ .

3. If  $\frac{X^2}{Y^2} = \frac{Z}{a^2}$  and  $X^2 = 2Y^2$ , which of the following can be a value of a?

- (A)  $\sqrt{\frac{Z}{2}}$

- (B)  $\frac{Z}{2}$
- (C)  $\frac{2}{Z}$
- (D)  $\sqrt{\frac{2}{Z}}$
- (E)  $2Z$

The best answer is A.

$$X^2 = 2Y^2 \Rightarrow X^2/Y^2 = 2.$$

$$X^2/Y^2 = 2 = Z/a^2 \Rightarrow Z = 2a^2 \Rightarrow a = \pm\sqrt{\frac{Z}{2}} \text{ and so A is the right answer.}$$

4. If every digit of a whole number is either a 4 or a 6, the number must be

- (A) divisible by 2
- (B) divisible by 4
- (C) divisible by 6
- (D) divisible by 24
- (E) odd

The best answer is A.

An even number is a number where the units' digit is even.

Since both 4 and 6 are even, the units' digit must be even and the number is divisible by 2 and so A is the answer.

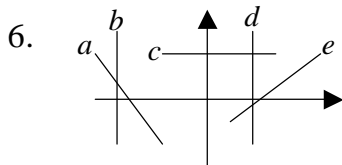
5. If  $3X - 7 = 68$ , then  $86 - 2X =$

- (A) 24
- (B) 36
- (C) 48
- (D) 52
- (E) 65

The best answer is B.

$$\text{Solve: } 3X - 7 = 68 \Rightarrow 3X = 75 \Rightarrow X = 25.$$

$$86 - 2X = 86 - 50 = 36 \text{ and so B is the right answer.}$$



Which of the following two lines are parallel?

- (A) e and a
- (B) c and d
- (C) b and e
- (D) d and b
- (E) a and c

The best answer is D.

Two parallel lines have the same slope.

The only two lines with the same slope among all the lines are b and d and therefore D is the right answer.

7. In which of the following answers, the fraction is equal to the number?

- (A)  $\frac{4}{5}$ , 0.45
- (B)  $\frac{5}{6}$ , 0.825
- (C)  $\frac{1}{5}$ , 0.1
- (D)  $\frac{7}{8}$ , 0.875
- (E)  $\frac{8}{9}$ , 0.9

The best answer is D.

The only answer where the fraction is equal to the number on the right is D.

$\frac{1}{8}$  is 0.125 and so  $\frac{7}{8}$  is equal to 0.875.

8. Steve buys a jeans and a t-shirt for \$64.25. If the jeans cost \$15.75 more than the t-shirt, how much does the t-shirt cost?

- (A) \$14.5
- (B) \$17
- (C) \$21
- (D) \$23
- (E) \$24.5

The best answer is E.

Let X be the cost of the t-shirt.

The jeans cost  $X + 15.75$ . The jeans and the t-shirt both cost

$2X + 15.75 = 64.25 \Rightarrow 2X = 64.25 - 15.75 = 48.5 \Rightarrow X = \$24.5$ .

9. Daniel bought a camera with 3 films for \$104. If the camera costs 10 times more than a film, how much will 2 cameras and 2 films cost?

- (A) \$56
- (B) \$112
- (C) \$158
- (D) \$176
- (E) \$182

The best answer is E.

Let  $X$  be the price of a film and so the price of a camera is  $10X$ .

$10X + 3X = 96 \Rightarrow 13X = 104 \Rightarrow X = \$8$  and a camera costs  $\$80$ .

2 cameras with 2 films will cost  $2(80) + 2(8) = \$176$ .

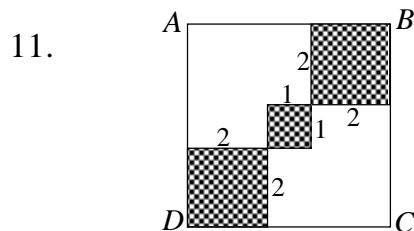
10. When an integer  $X$  is divided by a prime number  $Y$ , the result is always a fraction. Which of the following proves that the statement above is not true?

- (A)  $X=23, Y=3$
- (B)  $X=14, Y=5$
- (C)  $X=19, Y=2$
- (D)  $X=21, Y=7$
- (E)  $X=29, Y=11$

The best answer is D.

$X=21$ , which is an integer and  $Y=7$ , which is a prime number.

$X/Y = 21/7 = 3$ , which is not a fraction and therefore it proves that the statement is not definitely true.



In the figure above, there are three shaded squares blocked inside a larger square. What is the ratio between the shaded area to the area of the square ABCD?

- (A) 9:25
- (B) 1:2
- (C) 3:5
- (D) 3:8
- (E) 4:9

The best answer is A.

The area of the shaded region is the sum of the areas of three squares:

$$2 \times 2 + 1 \times 1 + 2 \times 2 = 9.$$

The area of the rectangle ABCD is  $(5) \times (5) = 25$ .

The required ratio is therefore 9:25.

12. In which of the following sets of numbers is the sum of the numbers greater than their product?

- (A) {1, 2, 3, 4}
- (B) {2, -2, 3, -3}
- (C) {1/2, 2, 3, 1/3}
- (D) {0, 1, -4, 3}
- (E) {12, -6, -2, 13}

The best answer is C.

Go over the sets of numbers and look for one set in which the sum is greater than the product. In the third set, the sum is greater than 5 yet the product is

$0.5 \times 2 \times 3 \times \frac{1}{3} = 1$  and therefore this is the right answer.

13. In a local pool there are 5000 liters. Water is being poured into the pool at a rate of  $X$  liters per second and also, because of a leak, water is leaking out at a rate of  $Y$  liters per minute. After  $Z$  seconds, how many liters are in the pool?

- (A)  $5,000 + Z(X - 60Y)$
- (B)  $5,000 - ZX + Y/60$
- (C)  $Z/X - Y/60 + 5,000$
- (D)  $Z(X - Y) + 5,000$
- (E)  $Z(X - Y/60) + 5,000$

The best answer is E.

In the beginning there are 5,000 liters in the pool.

Every second,  $X$  liters come in and  $Y/60$  liters come out.

And therefore after  $Z$  seconds there are  $5,000 + ZX - ZY/60$  liters in the pool, or  $Z(X - Y/60) + 5,000$  and so E is the right answer.

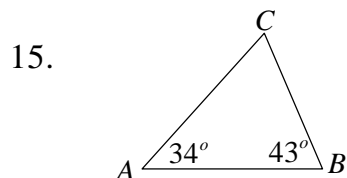
14. 55 percent of 80 are the same as 25 percent of which of the following numbers?

- (A) 176
- (B) 180
- (C) 184
- (D) 188
- (E) 192

The best answer is A.

55 percent of 80 are 50% of 80 + 5% of 80, which is  $40 + 4 = 44$ .

In order to find the number, divide 44 by 0.25 to get  $44 \times 4 = 176$  and therefore A is the right answer.



In the triangle above, which of the following must be true?

- (A)  $AC > AB$
- (B)  $AB < CB$
- (C)  $AB > AC$
- (D)  $AC > AB$
- (E)  $AC = CB$

The best answer is C.

The third angle of the triangle is therefore  $180 - 34 - 43 = 103^\circ$ .

A side in front of a larger angle is larger and therefore  $AB > AC > CB$ .

The only answer that is true is C.

16. Let  $@X$  be defined as  $(2X - 8)/(3X)$ . If  $@A = -2$ , which of the following values can replace A?

- (A) -2
- (B) -1
- (C) 1
- (D) 2
- (E) 4

The best answer is C.

Try out the answers to figure this one out.

Try  $A=1$ :  $@1 = (2 - 8)/3 = -2$  and so C is the right answer.

17. A new action was defined for every X:

$[X]$  = the largest possible integer, that is small or equal to X.

For example:  $[3.6] = 3$ .

What is the value of  $[6.4] \times [1/4] + [2] \times [7.178]$  ?

- (A) 14
- (B) 16
- (C) 18
- (D) 20
- (E) 22

The best answer is A.

The expression is also equal to  $6 \times 0 + 2 \times 7 = 14$  and so A is the answer.

18. Let  $\sim(A, B)\sim$  be defined as the remainder of the partition A/B.

What is the value of  $\sim(163, 7)\sim$  ?

- (A) 1
- (B) 2

- (C) 3
- (D) 4
- (E) 5

The best answer is B.

163 divided by 7 is 23 with a remainder of 2.

The answer to the question is the remainder and so B is the right answer.

19. If  $2X = 3Y$ ,  $2Y = 3Z$ ,  $2Z = 3R$  and  $2R = 3S$ , what is the value of  $X/S$ ?

- (A)  $16/81$
- (B)  $3/13$
- (C)  $13/3$
- (D)  $6/15$
- (E)  $81/16$

The best answer is E.

$X = 3Y/2 = 1.5Y = 1.5(1.5Z) = 1.5(1.5(1.5R)) = 1.5(1.5(1.5(1.5S))) = S(3/2)^4 = S(81/16)$ .

$X/S = (81/16)$  and therefore E is the right answer.

20. Which of the following is equal to the sum of two consecutive odd integers?

- (A) 345
- (B) 361
- (C) 382
- (D) 396
- (E) 411

The best answer is D.

Let  $X$  be one of the integers and  $X + 2$  the other.

We know that  $X + X + 2 = 2X + 2$  is equal to one of the answers and so subtract 2 from the answer, divide by two and see if you get an odd integer.

All the answers except for C and D are disqualified since they're odd.

Check C:  $382 - 2 = 380 \Rightarrow 380/2 = 190$ , which is even

Check D:  $396 - 2 = 394 \Rightarrow 394/2 = 197$ , which is odd and this is the answer.

21. If  $X$  is even and  $Y$  is odd, which of the following must be an integer?

- (A)  $XY/2$
- (B)  $(X + Y)/2$
- (C)  $XY/3$
- (D)  $(X + Y)/3$



(E)  $(X + Y)/XY$

The best answer is A.

In these types of questions, the easiest way is to pick up numbers.

Let  $X=2$  and  $Y=1$ .

Answer A is an integer since  $XY/2 = 2/2 = 1$  and so this is the right answer.

22. E is an even number. To which of the following  $E^3$  doesn't necessarily divide to with out a remainder?

- (A) 2
- (B) E
- (C)  $E^3$
- (D) 8
- (E) 16

The best answer is E.

Every even number in the power of 3 is divisible by 1, itself, itself in the power of 3 and 8 and therefore E is the only answer left.

Try any number in order to validate this principle.

23. If the first angle in a triangle is equal to two thirds of the second angle and the second angle is equal to one fifth of the third angle, what is the measurement of the median angle in the triangle?

- (A) 18
- (B) 27
- (C) 26
- (D) 84
- (E) 135

The best answer is B.

Let the median angle (the one we are looking for) be X.

We know that the first angle is  $2X/3$  and that the third angle is  $5X$ .

The sum of the angles in the triangle is equal to  $180^\circ$  and therefore

$X + 2X/3 + 5X = 180 \Rightarrow 20X/3 = 180 \Rightarrow X = 27^\circ$  and so the right answer is B.

24. It takes Gloria 7.5 hours to knit 6 sweaters. If Cynthia can knit three times faster, how many minutes would it take her to knit 3 sweaters?

- (A) 15
- (B) 25
- (C) 50
- (D) 75

(E) 100

The best answer is D.

Cynthia can knit three times faster and therefore it takes her 2.5 hours to knit 6 sweaters and half that time to knit 3 sweaters.

Half of 2.5 hours is one hour and a quarter, which is 75 minutes.

25. Three carpenters, working at a constant rate, can build a cabin in 7 hours.

How many hours would it take 7 carpenters, working at a constant rate, to built the same cabin?

(A) 2

(B) 3

(C) 4.5

(D)  $6\frac{1}{3}$

(E) 7

The best answer is B.

Instead of three carpenters, now we have 7, which is 2.5 times the manpower. If there are 2 and a third times the workers it would cut the time by 2 and a third also and therefore it would take  $7/2\frac{1}{3} = 3$  hours to built the same cabin and B is the right answer.

1.  $(7 + 11)^2 =$

(A)  $(7 \times 11)(7 + 11)$

(B)  $(11 - 7)(11 + 7)$

(C)  $4^2$

(D)  $10^2 + 8^2$

(E) 324

The best answer is E.

First add the numbers in the parenthesis and only then relate to the power.

$(7 + 11)^2 = 18^2 = 324$  and so E is the right answer.

2.  $(17 + 19) =$

(A)  $(19 - 17)(17 - 19)$

(B) 46

(C)  $\frac{(17^2 - 19^2)}{(17 - 19)}$

(D)  $6^2/2$

(E)  $79 - 11$

The best answer is C.

Answer C can also be written as  $\frac{(17^2 - 19^2)}{(17 - 19)} = \frac{(17 - 19)(17 + 19)}{(17 - 19)} = (17 + 19)$ .

3. The average (arithmetic mean) of 4 numbers is 100.

If three of the numbers are 20, 60 and 80, what is the fourth number?

- (A) 120
- (B) 180
- (C) 220
- (D) 240
- (E) 360

The best answer is D.

Let the fourth number be X.

Use the average formula:  $\frac{20 + 80 + 60 + X}{4} = 100 \Rightarrow$

$X = 400 - 20 - 80 - 60 = 240$  and so D is the right answer.

4. If the average (arithmetic mean) of 7 numbers is 343, what is sum?

- (A) 49
- (B) 187
- (C) 343
- (D) 1520
- (E) 2401

The best answer is E.

The sum of the numbers is actually the average multiplied by the amount of numbers, thus  $343 \times 7 = 2401$  and so the right answer is E.

5. If  $6X + 9Y = 23$ , what is the value of  $(15X + 22.5Y)$ ?

- (A) 57.5
- (B) 54.5
- (C) 49
- (D) 37
- (E) 31.5

The best answer is A.

Take  $6X + 9Y = 23$  and multiply it by 2.5:

$(6 \times 2.5)X + (9 \times 2.5)Y = 23 \times 2.5 \Rightarrow 15X + 22.5Y = 57.5$  and so the right answer is A.

6. The movie “Back to the past” is two hours and 15 minutes long. How many times can the theater run the entire movie in 12 hours assuming that each movie starts right after the previous one?

- (A) Once
- (B) Twice
- (C) Three times
- (D) Four times
- (E) Five times

The best answer is D.

Each movie is 2.25 hours.

We were asked how many whole times is 2.25 fit inside 12.

$12/2.5 = 4$  and a remainder and therefore D is the right answer.

7. It takes Adam one hour and 40 minutes to put together one puzzle. How many complete puzzles can Adam put together in 14 hours?

- (A) 9
- (B) 8
- (C) 7
- (D) 6
- (E) 5

The best answer is B.

One hour and 40 minutes is  $1\frac{2}{3}$  hours.

Divide 14 by  $1\frac{2}{3}$  to get:  $\frac{14}{\left(1\frac{2}{3}\right)} = \frac{14}{\frac{5}{3}} = \frac{14 \cdot 3}{5} = \frac{42}{5} = 8\frac{2}{5}$ .

And so Adam will complete only 8 complete puzzles.

8. If  $(-1 < A < 0)$  and  $(0 < B < 1)$ , which of the following must be true?

- (A)  $A + B = 0$
- (B)  $AB > 0$
- (C)  $AB < 0$
- (D)  $B - A < 0$
- (E)  $A - B > 0$

The best answer is C.

Pick up a number for A and for B.

For example:  $A = -1/2$  and  $B = 1/2$ .

The only true statement is that  $AB < 0$  and so answer C is the right answer.

9. If  $X = |x|$ , which of the following can be true?

- (A) X is positive
- (B) X is even
- (C) X is odd
- (D)  $X = 0$
- (E) All the answers are correct

The best answer is E.

All of the answers are good, since the only wrong answer would be: X is negative. There is no such answer among the answers and so all of them are correct.

10. Z is a prime number larger than 10. If  $Y = 3Z + 2$ , which of the following must be true?

- (A) Y is even
- (B) Y is divisible by 7
- (C) Y is a prime number
- (D) Y is odd
- (E) Y is divisible by 3

The best answer is D.

Any prime number larger than 10 is also odd.

$3Z$  is an odd number and when you add 2 to an odd number, the result is also odd and so the right answer is D.

11. If A is prime number bigger than 3, which of the following is even?

- (A)  $A + 4$
- (B)  $A^2 + 2$
- (C)  $(A - 1)^2$
- (D)  $2A + 1$
- (E)  $A - 2$

The best answer is C.

Take  $A = 5$  for example.

Only answer C is even,  $(5 - 1)^2 = 4^2 = 16$  and therefore the right answer is C.

12.  $3X$ ,  $4X$  and  $5X$  are three angles in a triangle, what is the value of X?

- (A) 8
- (B) 12

- (C) 15
- (D) 18
- (E) 22

The best answer is C.

The sum of all the angles in the triangle is  $180^\circ$ .

$$\Rightarrow 3X + 4X + 5X = 180^\circ \Rightarrow 12X = 180 \Rightarrow X = 15^\circ.$$

13. The cost of 3 markers is N cents. At this rate, what is the cost, in dollars, of 420 markers?

- (A) 140N
- (B) 14N
- (C) 1.4N
- (D) 140/N
- (E) N/1.4

The best answer is C.

The cost of 3 markers is N cents.

$420/3 = 140$  and so it will cost 140N cents to buy 420 markers.

$140N = 1.4N$  dollars and so C is the right answer.

14. If  $\frac{7}{Y} + \frac{6}{7} = \frac{13}{7}$ , what is the value of 3Y?

- (A) 35
- (B) 28
- (C) 21
- (D) 14
- (E) 6

The best answer is C.

Multiply the expression by 7Y:  $49 + 6Y = 13Y \Rightarrow 7Y = 49 \Rightarrow Y=7$ .

The value of 3Y is therefore 21.

15. What percent of 150 are 12?

- (A) 4.5%
- (B) 8%
- (C) 6%
- (D) 12%
- (E) 14%

The best answer is B.

Use the answers.

Try answer B:  $\frac{8}{100} \times 150 = \frac{8 \times 15}{10} = \frac{120}{10} = 12$  and so the right answer is B.

16. If A(4, 3), B(X, 3) and C(5, X) are three vertices of a triangle, what is its area?

- (A) 24
- (B)  $X^2 + 12$
- (C)  $24 + X^2$
- (D)  $X^2$
- (E)  $0.5X^2 - 3.5X + 6$

The best answer is E.

Draw an axis system with the relevant points.

The area of the triangle is AB multiplied by the height of the triangle.

The base of the triangle is  $X - 4$  in length and the height of the triangle

is  $X - 3$ . The area of the triangle is therefore:

$$\frac{(X-4)(X-3)}{2} = \frac{X^2 - 7X + 12}{2} = 0.5X^2 - 3.5X + 6 \text{ and so E is the answer.}$$

17. A, B and C are three consecutive numbers ( $C > B > A$ ).

What is the value of the expression  $(C - A)^2(B - A)^2(C - B)^2$  ?

- (A) 1
- (B) 2
- (C) 3
- (D) 4
- (E) 5

The best answer is D.

If the numbers are consecutive,  $B = A+1$  and  $C = A + 2$ .

$(C - A)^2(B - A)^2(C - A)^2 = 2^2 \times 1^2 \times 1^2 = 4$  and so the right answer is D.

18. A blue marble is worth \$2 and a red marble is worth \$3.

A jar contains 5 blue marbles and 4 red marbles only. If only one marbles is pulled at once, what is the probability of pulling marbles that are worth \$5?

- (A)  $\frac{2}{3}$
- (B)  $\frac{3}{4}$
- (C)  $\frac{4}{9}$
- (D)  $\frac{1}{2}$
- (E)  $\frac{2}{9}$

The best answer is B.

The only possible way of pulling marbles that are worth \$5 is by pulling a red and then a blue marble or the opposite.

The probability of pulling a red and then a blue marble is:  $\frac{4}{10} \cdot \frac{5}{9} = \frac{20}{90} = \frac{2}{9}$ .

The probability of pulling a blue and then a red marble is:  $\frac{5}{10} \cdot \frac{4}{9} = \frac{20}{90} = \frac{2}{9}$ .

The combined probability is  $\frac{2}{9} \times 2 = \frac{4}{9}$ .

19. For which values of A, is  $(A - 5)^2 = (5 - A)^2$  ?

- (A) A = 18
- (B) A = 21
- (C) A = -12
- (D) A = -21
- (E) All the answers are correct

The best answer is E.

Open the parenthesis:

$$(A - 5)^2 = A^2 - 10A + 25.$$

$(5 - A)^2 = A^2 - 10A + 25$  and so any number you'll plug in for A, is good.

20. If  $Z = 3X + 7$  and the value of X decreases by 2, then the value of Z will decrease by which of the following answers.

- (A) 6
- (B) 5
- (C) 4
- (D) 3
- (E) 2

The best answer is A.

Plug in  $X - 2$  instead of X:

$Z = 3X + 7 = 3(X - 2) + 7 = 3X - 6 + 7 = 3X + 1$ , which is smaller from the original Z by 6 and so A is the right answer.

21. Let's define  $\Lambda$  as a new action.

If  $\Lambda(5) = 13$ , which of the following can be equal to  $\Lambda(x)$ ?

- (A)  $3x + 1$
- (B)  $2x + 1$
- (C)  $3x - 2$
- (D)  $4x - 4$
- (E) Answers B and C are correct



The best answer is E.

13 can be also  $5 \times 2 + 1$  and  $5 \times 3 - 2$  and therefore

$\Lambda(x)$  can be equal to  $2x + 1$  or  $3x - 2$ .

22. Let's define  $\Omega$  as a new action.

If  $\Omega(5) = 23$ , which of the following can be equal to  $\Omega(z)$ ?

(A)  $5z + 2$

(B)  $z^2 - 2$

(C)  $4z - 3$

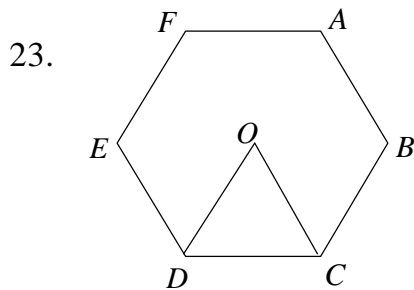
(D)  $z^2 + 3$

(E)  $3z + 4$

The best answer is B.

23 can be equal to  $5^2 - 2 = 25 - 2 = 23$ .

$\Omega(z)$  can be equal to  $z^2 - 2$ .



ABCDEF is a regular Hexagon, as shown in the figure above.

If O is the centre of the hexagon, what is the value of the angle ODC?

(A) 60

(B) 80

(C) 100

(D) 120

(E) 150

The best answer is A.

There are 6 main angles in the hexagon (like angle DOC) and so each one of them, including DOC, is equal to  $360/6 = 60^\circ$ .

$OD = OC$  since ABCDEF is a regular hexagon.

DOC is an isosceles with an angle of  $60^\circ$  and therefore the rest of the angles are also  $60^\circ$  and so A is the right answer.

24. 10,000 liters of water contain 3 grams of sodium.

How many grams of sodium can be found in  $10^5$  liters of water?

(A) 0.3

(B) 3

(C) 30

- (D) 300
- (E) 3,000

The best answer is C.

10,000 are  $10^4$  and so  $10^5$  are  $\frac{10^5}{10^4} = 10^1 = 10$ .

There are  $3 \times 10 = 30$  grams of sodium in  $10^5$  liters of water and so the right answer is C.

25. If the distance between A and C is 13 and the distance between A and B is 5, which of the following is true?

- (A)  $BC = 8$
- (B)  $BC < 13$
- (C)  $BC > 13$
- (D)  $8 < BC < 18$
- (E) None of the answers is correct

The best answer is D.

The question didn't mention that the points are on the same straight line or that B is between A and C.

The largest distance between B and C can be  $13 + 5 = 18$ .

The smallest distance between B and C is  $13 - 5 = 8$  and therefore the best answer is D.

1. If  $6Y + 3 = 39$ , what is the value of  $\sqrt[3]{Y + 2}$  ?

- (A) 1
- (B) 2
- (C) 2.5
- (D) 3
- (E) 3.5

The best answer is B.

Solve  $6Y + 3 = 39 \Rightarrow 6Y = 36 \Rightarrow Y = 6$ .

The value of  $\sqrt[3]{Y + 2}$  is  $\sqrt[3]{8} = 2$  since  $2^3 = 8$  and therefore the right answer is B.

2. If  $4X + 5 = 3X + 17$ , what is the value of  $X/Y$  assuming that Y is a quarter of X?

- (A) 2

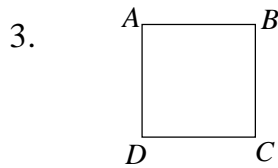
- (B) 3
- (C) 4
- (D) 5
- (E) 6

The best answer is C.

Solve:  $4X + 5 = 3X + 12 \Rightarrow X = 12$ .

Y is a quarter of X, which is  $\frac{1}{4} \times 12 = 3$ .

$X/Y = 12/3 = 4$  and so the right answer is C.



The figure above is of a square. What is the least number of lines that must be added to the figure so that the resulting figure will consist of 4 isosceles triangles?

- (A) One
- (B) Two
- (C) Three
- (D) Four
- (E) Five

The best answer is B.

By simply adding two diagonals to the square, it will divide into 4 identical triangles, each is an isosceles and so the right answer is B.

4. A C.N.C machine produces 120 parts in 4 hours. At this rate, in how many *minutes* can the C.N.C machine produce 15 parts?

- (A) 0.25
- (B) 0.5
- (C) 15
- (D) 30
- (E) 45

The best answer is D.

The machine produces 120 parts in 4 hours and so it produces  $120/4 = 30$  parts in one hour.

15 parts are half of 30 and therefore it will take the machine  $60/2 = 30$  minutes to produce this amount of parts.

5. A propeller lathe factory produces 4 propellers in 7 hours.

At this rate, in how many minutes can the factory produce one part?

- (A) 15
- (B) 75
- (C) 105
- (D) 120
- (E) 150

The best answer is C.

4 propellers are produced in 7 hours and so one propeller is produced in  $7/4$  hours, which is  $7 \times 60 / 4 = 105$  minutes and so C is the right answer.

6. If  $A = 7$ , what is the value of  $A^2(B - 3A)$  in terms of B?
- (A)  $1029 - 49B$
  - (B)  $49A - 1029$
  - (C)  $21B - 1029$
  - (D)  $1029B - 49$
  - (E)  $49B - 1029$

The best answer is E.

If  $A = 7$ ,  $A^2(B - 3A) = 49(B - 21) = 49B - 49 \times 21 = 49B - 1029$  and so E is the right answer.

7. 

In the figure above, if B is the midpoint of AC and X is equal to 3, what is the length of BC?

- (A) 3
- (B) 4
- (C) 5
- (D) 6
- (E) 7

The best answer is D.

$AB = X + 3 = 3 + 3 = 6$ .

Since B is the midpoint of AC,  $AB = BC$  and so BC is also equal to 6 and the right answer is therefore D.

8. If A is equal to 15% of D, B is equal to 22% of D and C is equal to 41% of D, what is  $2A + B + C$  in terms of D?
- (A)  $1.2D$
  - (B)  $0.93D$
  - (C)  $0.78D$
  - (D)  $0.63D$
  - (E)  $0.5D$

The best answer is B.

According to the question:

$A = 0.15D$ ,  $B = 0.22D$  and  $C = 0.41D$ .

The value of  $2A + B + C$  is  $2(0.15D) + 0.22D + 0.41D = 0.93D$  and so B is the right answer.

9. If X is 40% of Y and Y is 20% of Z, what is Z in terms of X?

- (A)  $0.08X$
- (B)  $1.25X$
- (C)  $3.5X$
- (D)  $12.5X$
- (E)  $15X$

The best answer is D.

According to the question:  $X = 0.4Y$  and  $Y = 0.2Z$ .

$X = 0.4Y = 0.4(0.2Z) = 0.08Z \Rightarrow Z = 1/0.08 \times X = 12.5X$  and so D is the right answer.

10. A canister holds four pints of black powder (1 pint =  $1/8$  gallon).

If a quarter of packet of black powder contains 3 pints, how many canisters can be filled with 20 packets?

- (A) 60
- (B) 25
- (C) 15
- (D) 10
- (E) 5

The best answer is C.

20 packets contain  $20 \times 3 = 60$  pints.

Every canister contains 4 pints and therefore with 60 pints ( $60/4 = 15$ ) canisters can be filled and the right answer is C.

11. On a number line, if point A has a coordinate -12 and point B has a coordinate of 24, what is the coordinate of point C, which is located one sixth of the way from B to A?

- (A) 18
- (B) 12
- (C) 6
- (D) 0
- (E) -6

The best answer is A.

Point C is located  $1/6$  of the way from B to A and so the point must be closer to B.

The length AB is therefore.  $24 - (-12) = 36$  and  $1/6$  of the way is 6.  
Point C is located at a coordinate of  $(24 - 6 = 18)$  and therefore A is the right answer.

12. A flock of B birds have 320 chicks. If each of the birds (In average) makes C more chicks per year, which of the following can represent the number of chicks in the flock after Y years assuming that a chick stays a chick forever?

- (A)  $320 + (BC/Y)$
- (B)  $320BC$
- (C)  $320 + YC/B$
- (D)  $320 + YBC$
- (E)  $BCY$

The best answer is D.

There are already 320 chicks in the flock which must be in the answer and so E is disqualified. Each year, each bird makes C chicks and so after Y years, B birds will make YBC chicks.

And therefore after Y years, there will be  $320 + YBC$  chicks and so D is the right answer.

13. X is a prime number between 0 and 20, what is the probability that X would be 7 or 11 ?

- (A)  $1/9$
- (B)  $1/6$
- (C)  $2/9$
- (D)  $1/3$
- (E)  $1/2$

The best answer is C.

Enumerate all the prime numbers from 0 to 20: 1, 2, 3, 5, 7, 11, 13, 17, 19.

We want to know what is the probability that X would be 7 or 11, which is 2 numbers out of 9  $\Rightarrow$  A probability of  $2/9$  and so C is the right answer.

14. If O is an odd number between 1 and 14 inclusive, what is the probability that O would be *smaller* than 8?

- (A)  $2/9$
- (B)  $1/2$
- (C)  $1/3$
- (D)  $4/7$
- (E)  $3/7$

The best answer is D.

Enumerate all the odd numbers between 1 and 14: 1, 3, 5, 7, 9, 11 and 13. Out of these 7 numbers, only 4 are smaller than 8 and therefore the probability is  $\frac{4}{7}$ .

15. A is divisible by 3. If  $B = 2A + 6$ , B is divisible by which of the following numbers?

- (A) 4
- (B) 5
- (C) 6
- (D) 9
- (E) 10

The best answer is C.

A is divisible by 3 and  $2A$  is divisible by 6.

6 is also divisible by 6 and therefore  $2X + 6$  must be divisible by 6 and C is the answer. Another way to solve this question is by plugging in some numbers.

16. Which of the following numbers is divisible by the greatest amount of prime numbers, which are different from one another?

- (A) 48
- (B) 50
- (C) 60
- (D) 72
- (E) 96

The best answer is C.

Factorize each of the answers:

$48 = 2 \times 2 \times 2 \times 2 \times 3$ , and thus 48 is divisible by only two primes: 2 and 3.

$50 = 2 \times 5 \times 5$ , 2 and 5 only.

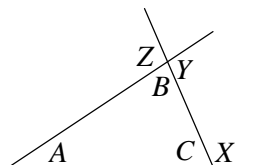
$60 = 2 \times 2 \times 3 \times 5$ , 2, 3 and 5- three primes.

$72 = 2 \times 2 \times 2 \times 3 \times 3$ , 2 and 3 only.

$96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$ , 2 and 3 only.

The answer is therefore C since 60 is divisible by 3 prime numbers.

17.



In the figure above, which of the following must be true?

- (A)  $B + C < Z$

- (B)  $Z = A + X$
- (C)  $Y - A < Z$
- (D)  $Z = A + X$
- (E)  $A = C$

The best answer is C.

All the answers are not necessarily true but C.

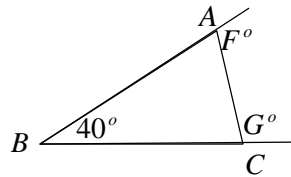
According to answer C,  $Y - A < Z$ .

Y is an outer angle to the triangle and thus equal to  $A + C$ .

Z is an outer angle to the triangle and thus equal to  $A + C$ .

$Y - A = C$  must be smaller than  $A + C$  and therefore this is the right answer.

18.



In the figure above, what is the measurement of G in terms of F?

- (A)  $220^\circ - F$
- (B)  $F + 40^\circ$
- (C)  $180^\circ - F$
- (D)  $F + 60^\circ$
- (E)  $120 - 2F^\circ$

The best answer is A.

F is an outer angle to the triangle, and so it is equal to two inner angles that are not adjacent to it.  $F = 40 + (180 - G) = 40 + 180 - G \Rightarrow G = 220^\circ - F$ .

19. If A is  $1/5$  of B, B is  $2/3$  of C and C is  $4/5$  of D, what is the value of A/D?

- (A)  $87/5$
- (B)  $5/87$
- (C)  $85/7$
- (D)  $7/12$
- (E)  $8/75$

The best answer is E.

$$A = 1/5 \times B = 1/5 \times (2/3 \times C) = 1/5 \times (2/3 \times (4/5 \times D)) = 8/75 \times D$$

$$A / D = 8/75.$$

20. In how many different ways can 6 people arrange themselves in 6 chairs if only 3 can seat in the first chair?



- (A) 60
- (B) 120
- (C) 150
- (D) 180
- (E) 360

The best answer is E.

In the first seat there are only three possibilities and after someone sat there, there will be 5 options for the next, 4 to the next one and so forth. The total number of possibilities is  $3 \times 5 \times 4 \times 3 \times 2 \times 1 = 360$  and so the right answer is E.

21. If  $9^{2.5Y} = 13$ , what is the value of  $3^{5Y}$  ?

- (A) 3
- (B) 9
- (C) 13
- (D) 69
- (E) 169

The best answer is C.

$9^{2.5Y} = 13 \Rightarrow 9 = 3^2$  and so  $9^{2.5Y} = (3^2)^{2.5Y} = 3^{5Y}$ .

Since  $9^{2.5Y} = 3^{5Y}$ , the right answer is C.

22. If  $8^A = 14$ , then  $8^{2A} =$

- (A) 1.4
- (B) 14
- (C) 144
- (D) 196
- (E) 216

The best answer is D.

$8^{2A} = (8^A)^2 = (14)^2 = 196$  and so the right answer is D.

23. Mike buys C cookies and eats 4 of them. In terms of C, what percent of the original amount of cookies are left?

- (A)  $100(C - 4) \%$
- (B)  $\frac{100(C - 4)}{C} \%$
- (C)  $\frac{100C}{C - 4} \%$
- (D)  $\frac{C - 4}{100} \%$

(E)  $\frac{C-1}{100C}\%$

The best answer is B.

A percent of something is the part that is left divided by the original part multiplied by 100 to get the answer in terms of percent.

There are  $(C - 4)$  cookies left and the original number of cookies is  $C$  and so the answer is  $(C - 4) / C \times 100\% = \frac{100(C - 4)}{C}\%$  and so the right answer is B.

24. The side of an equilateral triangle is lengthened by 6 Cm so the new perimeter is now 66 Cm. What is the original perimeter of the triangle?

- (A) 12
- (B) 16
- (C) 26
- (D) 48
- (E) 52

The best answer is D.

Let  $X$  be the original length of each of the sides of the equilateral triangle.

We can write  $3(X + 6) = 66 \Rightarrow X + 6 = 22 \Rightarrow X = 16$  Cm.

The original perimeter is therefore  $16 \times 3 = 48$  Cm.

25. Each side of a certain square is lengthened by 3 micrometers so the new area is increased by 117 micrometers squared. What is the original area of the square before the lengthening of its sides?

- (A) 324
- (B) 288
- (C) 256
- (D) 212
- (E) 196

The best answer is A.

Let  $X$  be the original length of the side of the square.

The area of the new square is therefore  $(X + 3)^2$ .

$$(X + 3)^2 = X^2 + 6X + 9.$$

The original area is  $X^2$  and so the increase is determined by  $6X + 9$  only and so we can write the following equation:  $6X + 9 = 117 \Rightarrow$

$$6X = 108 \Rightarrow X = 18.$$

The original area of the square is  $18 \times 18 = 324$ .

1. 15 Java programmers, working in a constant pace, finish a web page in 3 days. If after one day, 9 programmers quit, how many more days are needed to finish the remainder of the job?

- (a) 5.
- (b) 2.
- (c) 8.
- (d) 4.
- (e) 6.

The best answer is A.

The total working days for finishing a web page are  $(15 \times 3) 45$ . If after one day 9 programmers quit, only 15 working days are done and the rest of the programmers (6) Need to finish  $(45 - 15) 30$  days of work. It will take them 5 more days.

2. Two carpenters, working in the same pace, can build 2 desks in two hours and a half. How many desks can 4 carpenters build in 4 hours?

- (a) 2.4.
- (b) 3.6.
- (c) 4.2.
- (d) 5.5.
- (e) 6.4

The best answer is E.

2 carpenters build 2 desks in 2.5 hours ---> 4 carpenters build 4 desks in 2.5 hours ----  
> In 4 hours there are  $(4/2.5 = 1.6)$  time units. And  $(4 \times 1.6)$  is 6.4 desks.

6. There are 40 students in a classroom,  $9/20$  of them are boys and  $4/5$  of them are right-handed. How many right-handed boys are there in the classroom?

- (a) Between 10 and 32.
- (b) Between 14 and 32.
- (c) Between 10 and 18.
- (d) Between 14 and 18.
- (e) Between 18 and 36.

The best answer is C.

There are  $(9/20 \times 40 = 18)$  boys in the class. 80% of them are right-handed, meaning that  $(4/5 \times 18 = 14.4)$ . Answer C is the best answer.

7. In Jonathan's pen there are 300 sheep's.  $5/6$  of the sheep's are white,  $2/3$  of the sheep's have soft wool. What can't be the number of white sheep's that also have soft wool in the pen?

- (a) 100.
- (b) 200.

- (c) 190.
- (d) 180.
- (e) 160.

The best answer is A.

There are  $(5/6 \times 300 = 250)$  white sheep's.

There are  $(2/3 \times 300 = 200)$  soft woolen sheep's.

The maximum overlap is the size of the smallest among the groups, thus 200. The minimum overlap is  $(250 + 200 - 300 = 150)$ .

Therefore the number of sheep's can be somewhere between 150 and 200.

8. Ross has 40 shirts,  $3/4$  of the shirts are green and  $1/10$  is without buttons.

Therefore Ross has between \_\_\_\_ and \_\_\_\_ shirts with buttons that are not green.

- (a) 6 ; 10.
- (b) 4 ; 25.
- (c) 4 ; 10.
- (d) 5 ; 25.
- (e) 3 ; 10.

The best answer is A.

Notice that the groups that we are looking for a overlapping are the not-green shirts and the buttoned ones. The not-green shirts are a quarter of 40, 10 shirts.

The shirts with buttons are  $(9/10 \times 40 = 36)$ .

The maximum overlapping is the size of the smallest group: 10.

The minimum overlapping is:  $36 + 10 - 40 = 6$ .

Therefore A is the answer.

9. In the Kan film festival, 50 movies were presented.  $3/5$  of the movies are action movies and  $4/5$  is science fiction movies. How many of the movies were science fiction action movies?

- (a) 10.
- (b) 15.
- (c) 20.
- (d) 30.
- (e) 35.

The best answer is C.

There were  $(3/5 \times 50 = 30)$  action movies.

There were  $(4/5 \times 50 = 40)$  science fiction movies.

Exact overlapping is calculated by minimum overlapping method.

Therefore there are  $(40 + 30 - 50 = 20)$  movies that belong to both categories.

10. There are 200 cats in Cat-City. Out of the 200, 70 are street cats and the rest are domestic cats. 110 cats are gray, 30 out of the gray cats are domestic ones. How many domestic cats are there which are not gray in Cat-City?

- (a) 90.
- (b) 80.
- (c) 50.
- (d) 40.
- (e) 25.

The best answer is C.

Out of 200 cats, 130 are domestic ones. Out of 110 gray cats, 30 are street cats therefore 80 are grey and domestic ones.

Altogether there are 130 domestic cats, 80 are grey so  $(130 - 80) = 50$  are not grey.

11. Chandler is building a fence in the following method: He grounds 10 poles, each 10 Cm thick, in 1 meter spaces from each other. He then connects the poles with a barbed wire. What is the total length of the fence?

- (a) 11.
- (b) 12.
- (c) 9.9.
- (d) 10.
- (e) 13.

The best answer is D.

The total width of the poles is  $(10 \times 0.1 = 1)$  meter.

There are 9 spaces between the poles, each 1 meter, so it's another 9 meters.

The total length is  $(1 + 9 = 10)$  meters.

12. In a psychology school the grade of the students is determined by the following method: At the end of the first year the grade equals to twice the age of the student. From then on, the grade is determined by twice the age of the student plus half of his grade from the previous year. If Joey's grade at the end of the first year is 40, what will be his grade at the end of the third year?

- (a) 75.
- (b) 62.
- (c) 80.
- (d) 44.
- (e) 56.

The best answer is A.

From the grade 40 at the end of the first year we learn that his age is 20.

At the end of the second year, he will be 21 and his grade will be

$$(21 \times 2 + \frac{1}{2} \times 40 = 62).$$

At the end of the third year, he will be 22 and his grade will be  $(22 \times 2 + \frac{1}{2} \times 62 = 75)$ .

13. What is the sum of all the even numbers bigger than (-10) and smaller than 12?

- (a) 2.
- (b) 10.
- (c) 0.
- (d) 8.
- (e) 4.

The best answer is B.

This is a series of numbers with a constant spacing between them.

The first number is (-8) and the last is (10), there are 10 numbers altogether.

The formula for such a series is:  $((-8 + 10) \times 10)/2 = 10$ .

The second way to answer such a question is to write the numbers and add them.

14. The value of an “Aerosoul” stock changes according to the following method:

At the end of each month her value is doubled but due to commission the stock's value is decreases by \$10. If the value at the beginning of January is \$A, what would be her value at the end of February?

- (a)  $4A - 10$ .
- (b)  $4A - 20$ .
- (c)  $4A - 30$ .
- (d)  $4A - 40$ .
- (e)  $4A - 50$ .

The best answer is C.

At the end of January her value is  $2A - 10$ .

At the end of February her value is  $(2 \times (2A - 10) - 10 = 4A - 30)$ .

15. An Ameba is an organic life form that divides into two Amebas each round hour.

If at a certain round hour, two Amebas were placed in a jar, how many Amebas will be in the jar in N hours?

- (a)  $2N$
- (b)  $2^{2N}$
- (c)  $2^{N+1}$
- (d)  $2^{N-1}$
- (e)  $2^N$

The best answer is C.

Let's find the number of Amebas in the first hours.

After one hour ( $N=1$ ) there will be 4 Amebas.

After two hours ( $N=2$ ) there will be 8 Amebas.

After three hours ( $N=3$ ) there will be 16 amebas.

Therefore the formula that fits this series is  $2^{N+1}$ .

16. Alfa, Beta and Gamma are inner angles in a triangle. If  $\text{Alfa} = \text{Beta} + \text{Gamma}$ , what can't be the size of Beta?

- (a) 44 degrees.
- (b) 45 degrees.
- (c) 89 degrees.
- (d) 90 degrees.
- (e) There isn't enough data to determine.

The best answer is D.

If Beta is 90 degrees then Alfa is bigger than 90 and the sum of the angles in the triangle will be bigger than 180 degrees.

18. In a triangle, one side is 6 Cm and another side is 9 Cm. which of the following can be the perimeter of the triangle?

- (a) 18.
- (b) 25.
- (c) 30.
- (d) 32.
- (e) 34.

The best answer is B.

The third side of the triangle is larger than 3 (The difference between the other two) and smaller than 15 (The sum of the other two).

The perimeter is between  $(6+9+3 = 18)$  and  $(6+9+15 = 30)$ . The only answer that is in this range is B.

19. To which of the following shapes the area can't be calculated if the perimeter is given?

- (a) Circle.
- (b) An isosceles right triangle.
- (c) Rectangle.
- (d) A regular Hexagon.
- (e) Square.

The best answer is C.

The perimeter of a rectangle is  $2a + 2b$ . In order to calculate the area we need to know the multiplication of  $a \times b$ .

20. A and B are two circles. The radius of A is twice as large as the diameter of B. What is the ratio between the areas of the circles?

- (a) 1:8.
- (b) 1:2.
- (c) 1:4.
- (d) 1:16.

(e) 1:6.

The best answer is D.

The radius of circle A is 4 times larger than the radius of circle B. The area of a circle is a function of the radius squared, therefore the area of radius A is 16 times bigger.

21. A, B, C, D and E are 5 consecutive points on a straight line. If  $BC = 2CD$ ,  $DE = 4$ ,  $AB = 5$  and  $AC = 11$ , what is the length of AE?

- (a) 21.
- (b) 26.
- (c) 30.
- (d) 18.
- (e) 16.

The best answer is D.

First, draw the line and the points.

In order to find the length of AE, find the length of CD and BC first.

$$BC = AC - AB = 11 - 5 = 6.$$

$$BC = 2CD \Rightarrow CD = 3.$$

$$AE = 5 + 6 + 3 + 4 = 18.$$

22. In a rectangular axis system, what is the distance between the following points: A(3,2) and B(7,5) ?

- (a) 5.
- (b) 7.
- (c) 6.
- (d) 4.
- (e) 3.

The best answer is A.

First, draw a rectangular axis system and mark the two points.

The easiest way to find the distance between them is to draw a triangle, where the line AB is the hypotenuse. You can see that the length of one side of the triangle is  $(5-2=3)$  and the other side is  $(7-3=4)$ . The length of the line AB is received with the help

Of the Pythagoras principle:  $AB = \sqrt{3^2 + 4^2} = 5$ .

23. In a rectangular axis system, what is approximate distance between the following points: C(1,2.5) and D(6.5,5.5) ?

- (a) 5.5.
- (b) 7.2.
- (c) 6.3.
- (d) 4.1.
- (e) 3.8.

The best answer is C.

First, draw a rectangular axis system and mark the two points.



The easiest way to find the distance between them is to draw a triangle, where the line CD is the hypotenuse. You can see that the length of one side of the triangle is  $(5.5 - 2.5 = 3)$  and the other side is  $(6.5 - 1 = 5.5)$ . The length of the line CD is received with the help Of the Pythagoras principle:  $CD = \sqrt{3^2 + 5.5^2} = \sqrt{39.25} \cong 6.3$ .

24. In a rectangular axis system, what is the distance between the following points: A(24.4,30) and B(34.4,42.49) ?

- (a) 5.
- (b) 7.
- (c) 8.
- (d) 12.
- (e) 16.

The best answer is A.

First, draw a rectangular axis system and mark the two points.

The easiest way to find the distance between them is to draw a triangle, where the line AB is the hypotenuse. You can see that the length of one side of the triangle is  $(34.4 - 24.4 = 10)$  and the other side is  $(42.49 - 30 = 12.49)$ . The length of the line AB is received with the help

Of the Pythagoras principle:  $AB = \sqrt{10^2 + 12.49^2} = \sqrt{256} = 16$ .

25. In a rectangular axis system, what is the area of a parallelogram with the coordinates: (5,7), (12,7), (2,3), (9,3) ?

- (a) 21.
- (b) 28.
- (c) 35.
- (d) 49.
- (e) 52.

The best answer is B.

First, draw the axis system and mark the 4 points. Connect the points to get a parallelogram. The area is calculated by the multiplication of one on of the bases and the height. The height is  $(7 - 3 = 4)$ , the length of the base is  $(9 - 2 = 7)$ . The area is  $4 \times 7 = 28$ .

29. If the radius of a cylinder is doubled and so is the height, what is the new volume of the cylinder divided by the old one?

- (a) 8.
- (b) 2.
- (c) 6.
- (d) 4.
- (e) 10.

The best answer is A.

The volume of a cylinder is  $(\pi \times R^2) \times (\text{height of cylinder})$ .  
The new volume is  $(4 \times 2 = 8)$  bigger.

30. If the radius of a cylinder is doubled and so is the height, how much bigger is the new lateral surface area (with out the bases)?
- (a) 8.
  - (b) 2.
  - (c) 6.
  - (d) 4.
  - (e) 10.

The best answer is D.

The lateral surface area of a cylinder is  $(2 \times \pi \times R) \times (\text{height of cylinder})$ .  
The new lateral surface area is  $(2 \times \pi \times 2R) \times (\text{double the height}) = 4$  times bigger.

1. If  $X \sim Y = X^2 + XY$ , then what is the value of  $-1 \sim 2$  ?
- (a) 1.
  - (b) -1.
  - (c) 3.
  - (d) 4.
  - (e) 2.

The best answer is B.

$$-1 \sim 2 = (-1)^2 + (-1)2 = -1.$$

2. If  $X, Y = XY^2$ , then what is the value of  $3, (t-1)$  ?
- (a)  $3t^2 - 2t + 2$ .
  - (b)  $3t^2 - 2t + 4$ .
  - (c)  $3t^2 - 6t + 3$ .
  - (d)  $3t^2 - 6t - 3$ .
  - (e)  $3t^2 - 6 + 3$ .

The best answer is C.

$$3, (t-1) = 3(t-1)^2 = 3(t^2 - 2t + 1) = 3t^2 - 6t + 3.$$

3. If  $Q \square = Q + 2$ , then what is the value of  $(3 \square) \square$  ?
- (a) 7.
  - (b) 5.
  - (c) 6.
  - (d) 4.

(e) 8.

The best answer is A.

$$(3r)\square = (3 + 2)\square = 5\square = 5 + 2 = 7.$$

4. If  $(3\square)\square = 9$ , then which of the following expressions can  $x\square$  be equal to?

(a)  $x^2$ .

(b)  $3x - 5$ .

(c)  $2x - 1$ .

(d)  $2x + 1$ .

(e) none of the answers above.

The best answer is C.

Check the answers by replacing the  $x$  with 3 and try to see if it works out.

Answer (a):  $(3\square)\square = (3^2)^2 = 81$ . Not good.

Answer (b):  $(3\square)\square = (3 \times 3 - 5)\square = (4)\square = (12 - 5) = 7$ . Not good either.

Answer (c):  $(3\square)\square = (3 \times 2 - 1)\square = (5)\square = (10 - 1) = 9$ . Good enough.

5. If  $(4\square 2 = 14)$  and  $(2\square 3 = 6)$ , what can replace  $(a\square b)$  ?

(a)  $ab$ .

(b)  $(a+3)b$

(c)  $a^2 - b$ .

(d)  $a^b - 2$ .

(e)  $b^a + 1$ .

The best answer is D.

Check every answer until you hit the jackpot.

(a)  $(4\square 2) = 8$ . The answer should be 14.

(b)  $(2\square 3) = (2 + 3)3 = 15$ . The answer should be 6.

(c)  $(2\square 3) = (2^2 - 3) = 1$ . The answer should be 6.

(d)  $(4\square 2) = (4^2 - 2) = 14$ . This is the right answer, check  $(2\square 3)$  also.

6. If  $\square(a,b) = \frac{3a}{\sqrt{b}}$ , what is the value of  $\square[\square(4,4),\square(1,9)]$  ?

(a) 1.

(b) 4.

(c) 6.

(d) 9.

(e) 18.

The best answer is E.

Start with the inner parenthesis.

$$\square(4,4) = \frac{3 \cdot 4}{\sqrt{4}} = 6.$$

$$\square(1,9) = \frac{3 \cdot 1}{\sqrt{9}} = 1.$$

$$\square(6,1) = \frac{3 \cdot 6}{\sqrt{1}} = 18. \text{ Therefore E is the best answer.}$$

7. If  $5\square = 13$ , which of the following can describe  $a\square$ ?

- (a)  $3a + 1$ .
- (b)  $2a + 3$ .
- (c)  $3a - 2$ .
- (d)  $3a - 1$ .
- (e) Answers (b) and (c).

The best answer is E.

Check each and every answer:

- (a)  $5\square = 3 \times 5 + 1 = 16$ .
- (b)  $5\square = 2 \times 5 + 3 = 13$ .
- (c)  $5\square = 3 \times 5 - 2 = 13$ .

There is no need to check the final answer because we already know the right answer.

11. For every X, the action  $[X]$  is defined in the following matter:  $[X]$  is the greatest integer that is smaller or equal to X. For example:  $[8.9] = 8$ .

What is the value of  $[6.5] \times [2/3] + [2] \times 7.2 + [8.4] - 6.6$  ?

- (a) 15.8.
- (b) 16.2.
- (c) 16.4.
- (d) 14.4.
- (e) 12.6.

The best answer is A.

$$[6.5] \times [2/3] + [2] \times 7.2 + [8.4] - 6.6 = 6 \times 0 + 2 \times 7.2 + 8 - 6.6 = 15.8.$$

15. If  $(1 < A < 3 < B)$ , then which of the following expressions is the largest?

- (a)  $(B+2)/(A-1)$ .
- (b)  $(B-2)/(A+1)$ .
- (c)  $A/B$ .
- (d)  $(B-2)/(A-1)$ .
- (e)  $B/A$ .

The best answer is A.

Try some numbers and check the answers.  $A=2$ ,  $B=4$ .

- (a)  $6/1 = 6$ .
- (b)  $2/3$ .
- (c)  $1/2$ .
- (d) 2.
- (e) 2.

16. Which of the following fractions is the smallest?

- (a)  $\frac{3}{10}$ .
- (b)  $\frac{6}{19}$ .
- (c)  $\frac{3}{8}$ .
- (d)  $\frac{11}{30}$ .
- (e)  $\frac{12}{31}$ .

The best answer is A.

Compare all of the answers to (a)  $\frac{3}{10}$ .

- (b)  $\frac{3}{10} \times 2 = \frac{6}{20}$  which is smaller than  $\frac{6}{19}$ .
- (c)  $\frac{3}{10}$  is smaller.
- (d)  $\frac{3}{10} = \frac{9}{30}$ , and this is smaller than  $\frac{11}{30}$ .
- (e)  $\frac{3}{10} = \frac{12}{40}$  and that is smaller than  $\frac{12}{31}$ .

The smallest fraction is A.

17. Which of the following fractions is the largest?

- (a)  $\frac{2}{7}$ .
- (b)  $\frac{2}{3}$ .
- (c)  $\frac{7}{9}$ .
- (d)  $\frac{7}{12}$ .
- (e)  $\frac{3}{5}$ .

The best answer is C.

Lets compare all the answers to  $\frac{2}{7}$ , unless we find a larger fraction.

- (b)  $\frac{2}{3}$  is larger than  $\frac{2}{7}$ . For now, this is the right answer.
- (c)  $\frac{2}{3}$  is also  $\frac{6}{9}$  and that is smaller than  $\frac{7}{9}$ . For now this is the right answer.
- (d)  $\frac{7}{9}$  is bigger than  $\frac{7}{12}$ .
- (e) Bring this answer and (c) to a common denominator.  
 $\frac{7}{9} = \frac{35}{45}$  and  $\frac{3}{5} = \frac{27}{45}$ .  
 $\frac{7}{9}$  is the largest fraction.

19. If  $A^2 + B^2 = 15$  and  $AB = 10$ , what is the value of the expression  $(A - B)^2 + (A + B)^2$ ?

- (a) 10.
- (b) 20.
- (c) 30.
- (d) 60.
- (e) 70.

The best answer is C.

$$(A - B)^2 + (A + B)^2 = A^2 - 2AB + B^2 + A^2 + 2AB + B^2 = 2(A^2 + B^2) = 30.$$

20. If A and B are positive integers, which of the following expressions is not an integer for certain?

- (a)  $(2A^2 - 2B^2)/(A+B)$ .
- (b)  $(6B + 8A)/(3B + 4A)$ .
- (c)  $(3A - B)/(B - 3A)$ .
- (d)  $(A + B)/(A^2 + B^2 + 2AB)$ .
- (e)  $(A^2 - B^2)/(A - B)$ .

The best answer is D.

All the answers besides D are numbers after some simplification.

Answer D =  $(A + B)/(A+B)^2 = 1/(A+B)$ , and this is a fraction of a number.

21. In the “Big-Reds” parking lot there are 56 vehicles, 18 of them are buses and the rest are private cars. The color of 32 vehicles is red, from which 17 are buses. How many private cars can be found in the parking lot, which are not colored red?

- 1.
- 23.
- 17.
- 15.
- 20.

The best answer is B.

Out of 56 vehicles, 32 are colored red, therefore 24 are in different color.

17 of the red vehicles are buses, therefore  $(18 - 17 = 1)$  are in different color.

$(24 - 1 = 23)$  private cars are in the parking lot with a different color than red.

22. In Sam’s hanger there are 23 boxes, 16 out of the boxes are filled with toys and the rest are filled with electrical appliances. 8 boxes are for sale, 5 of them are filled with toys. How many boxes with electrical appliances are in Sam’s hanger that are not for sale?

- 1.
- 2.
- 3.
- 4.
- 5.

The best answer is D.

8 boxes are for sale, 5 of them are with toys, and therefore 3 of them are with electrical appliances.

Out of 23 boxes, 16 are with toys, therefore, and therefore 7 of them are with electrical appliances.

$(7 - 3 = 4)$  is the number of electrical appliances boxes, which are not for sale.

1. In the fifth grade at Parkway elementary school there are 420 students. 312 students are boys and 250 students are playing soccer. 86% of the students that play soccer are obviously boys. How many girl student are in Parkway that are not playing soccer?

- 69.
- 73.
- 81.
- 91.
- 108.

The best answer is B.

There are  $(420 - 312 = 108)$  girls in Parkway.

86% of 250 are boys, therefore 14% of 250 are girls that play soccer, which is 35 girls.

The number of girls that do not play soccer is  $(108 - 35 = 73)$ .

2. In the quiet town of “Nothintodo” there are 600 inhabitants, 400 are unemployed and 300 are somnambulists. If half of the somnambulists are unemployed, how many are employed and are not somnambulists?

- 50.
- 100.
- 150.
- 200.
- 300.

The best answer is A.

There are 300 people that are not somnambulists. There are  $(600 - 400 = 200)$  people that are employed in the town, half of the somnambulists are employed (150), therefore  $(200 - 150 = 50)$  is the number of people that are employed which are also not somnambulists.

3. In the youth summer village there are 150 people, 75 of them are not working, 50 of them have families and 100 of them like to sing in the shower. What is the largest possible number of people in the village, which are working, that doesn't have families and that are singing in the shower?

- 25.
- 50.
- 75.
- 100.
- 150.

The best answer is C.

The number of people that work is 75.

The number of people that doesn't have families is  $(150 - 50 = 100)$ .

100 of the people like to sing in the shower.

The largest possible number of people that belong to all three groups is the smallest among them, Meaning 75.

4. In the junior basketball league there are 18 teams,  $\frac{2}{3}$  of them are bad and  $\frac{1}{2}$  are rich. What can't be the number of teams that are rich and bad?

- 4.
- 6.
- 10.
- 7.
- 8.

The best answer is C.

$(\frac{2}{3} \times 18 = 12)$  teams are bad and 9 are rich.

The number of teams which are rich and that are bad must be between 9 and  $(9+12-18 = 3)$ .

The only answer, which is not in that range, is C.

5. In the third grade of Windblow School there are 108 students, one third of them failed the math test and  $\frac{1}{6}$  failed that literature test. At least how many students failed both tests?

- 0.
- 6.
- 8.
- 10.
- 12.

The best answer is A.

$(\frac{1}{3} \times 108 = 36)$  failed the math test.

$(\frac{1}{6} \times 108 = 18)$  failed that literature test.

The least amount of people that failed both tests is  $(18 + 36 - 108 = -54)$ , there cant be an negative Overlapping between the groups so the least amount of people who failed both tests is zero.

6. If  $\frac{1}{X} = 2.5$ , then what is the value of  $\frac{1}{(X - \frac{2}{3})}$ ?

- 2.25.
- 3.5.
- 3.75.
- 1.75.
- 3.75.

The best answer is C.

If  $\frac{1}{X}$  is 2.5 or  $\frac{5}{2}$  then  $X = \frac{2}{5}$ .

$\frac{1}{(\frac{2}{5} - \frac{2}{3})}$  is  $\frac{1}{(\frac{6}{15} - \frac{10}{15})} = -\frac{15}{4} = -3.75$ .



8. Travis is working as a programmer of IBW. Travis earns \$3,500 annually. If Travis pays 2.5% of that amount quarterly to support groups and he paid \$525 so far, for how many years now has Travis been paying?

- 2.
- 2.5.
- 4.
- 5.5.
- 6.

The best answer is B.

Travis pays 2.5% of 3500, which is \$87.5 every 3 months (quarterly).  
( $525/87.5 = 6$ ), therefore Travis has been paying for ( $6 \times 3 = 18$ ) months now, that is 2.5 years.

9. Dana borrows 5500 pounds annually for her college education. If Dana gives her parents 3% of that amount back each month, how much will she still owe her parents after four years of college?

- 12,430.
- 13,640.
- 14,000.
- 14,080.
- 15,020.

Dana takes 5500 each year and returns ( $0.03 \times 5500 = 165$ ) each month, which is ( $165 \times 12 = 1980$ ) each passing year. That means that each year Dana owes her parents ( $5500 - 1980 = 3520$ ) pounds.

After 4 years in college she will owe them ( $4 \times 3520 = 14,080$ ) pounds.

10. Mr. Rusty owes the bank \$1,040,000, he returns \$40,000 quarterly to the bank. If the tax on the money Rusty owes is compounded quarterly by 0.25% starting before Rusty paid the first payment, how months would it take poor Rusty to reach a point where he owes the bank no more than 1 million dollars?

- 3.
- 6.
- 9.
- 12.
- 15.

The best answer is B.

Every three months Rusty gives the bank \$40,000.

After the first quarter the bank took ( $0.0025 \times 1040000 = 2600$ ) and Rusty paid \$40,000 so the new

Debt is now ( $1,040,000 - 40,000 + 2,600 = 1,002,600$ ).

After the second quarter the bank took ( $0.0025 \times 1002600 = 2506.5$ ) and Rusty paid again \$40,000 so the new Debt is now ( $1,002,600 - 40,000 + 2506.5 < 1$  million dollars).

11. Simba borrowed \$12,000 from his brothers so he can buy a new sports car. If Simba returns 4.5% of that amount every 2 weeks, after how many months Simba wouldn't owe his brothers any more money?

- 8.
- 12.
- 15.
- 18.
- 20.

The best answer is B.

Simba gives ( $0.045 \times 12,000 = 540$ ) to his brothers every 2 weeks, in a month he gives ( $540 \times 2 = 1080$ ). ( $12,000/1,080$  is a little over 11), therefore after 12 months he won't owe any more money.

12. If A and B are two roots of the equation  $X^2 - 6.5X - 17$ , then what is the value of A x B?

- 15.
- 18.
- 16.5.
- 17.
- 22.

The best answer is D.

The roots of the equation are 8.5 and (-2).

The multiplication of the roots is equal to (-17).

13. If A,B and C are roots of the equation  $X^3 - 16X^2 + 48X$ , what is the sum of the roots?

- 16.
- 14.
- 17.
- 18.5.
- 22.5.

The best answer is A.

The equation can be written as:  $X(X^2 - 16X + 48) = X(X - 12)(X - 4)$ .

The roots of the equation are: 0,4 and 12. The sum of the roots is 16.

14. If R is a root of the equation  $X^2 + 3X - 54$ , than which of the following equations have also the root R ?

$X^2 - 12X + 27$ .

$X^2 - 6X - 16$ .

$X^2 - 10X - 31.25$ .

$X^2 - 15X + 54$ .

$X^2 + 10X + 16$ .

The best answer is D.

The original equation is  $X^2 + 3X - 54$ , it can be written as  $(X - 6)(X + 9)$ . The roots are 6 and (-9).

We are looking for an equation that has one of the same roots.

Answer D:  $X^2 - 15X + 54 = (X - 6)(X - 9)$  à This equation has the root 6.

All the other answers have different roots than the original equation.

15. If P is a root of the equation  $X^3 + 10X^2 + 16X$ , than which of the following equations have also the root P ?

$X^2 - 10X + 16$ .

$X + 8$ .

$X^2 + 3X - 54$ .

$X^2 - 6X - 187$ .

$X^2 + 8X - 20$ .

The best answer is B.

The original equation is  $X^3 + 10X^2 + 16X$ , it can be written as  $X(X + 8)(X + 2)$ . The roots are

(-8), 0 and (-2).

We are looking for an equation that has one of the same roots.

Answer B:  $X + 8$  à This equation has the root (-8).

All the other answers have different roots than the original equation.

16. If X is a root of the equation  $a^3 + 8a^2 - 20a$ , than which of the following equations Don't have the root X as one of their roots?

$X^3 + 4X^2 - 32X$ .

$X^2 + 18X + 80$ .

$X^2 - 12X + 20$ .

$X^2 + 5X - 14$ .

$X^2 + 10X + 16$ .

The best answer is E.

The original equation is  $a^3 + 8a^2 - 20a$ , it can be written as  $a(a - 2)(X + 10)$ . The roots are 2, 0 and (-10).

We are looking for an equation that has none of the same roots.

Answer E:  $X^2 - 10X + 16 = (X + 2)(X + 8)$  à This equation has none of the original roots. All the other answers have one or more of the same original roots.

1. M.A.S (Most Affordable Speed) is defined as the speed where the fuel consumption of a car is the lowest. The average family car consumes 3 liters of fuel per 36 kilometers at the M.A.S with only one passenger (the driver). A pickup truck consumes twice as much as a family car does. Assuming the fuel consumption of both cars rises by  $3\frac{1}{3}\%$  of the original consumption for each additional passenger, how many km per liter would a pickup truck do if the driver has three additional passengers?

- (a) 10 km
- (b) 5.8 km
- (c) 6 km.
- (d) 5.4 km.
- (e) 4 km.

2. A windmill is taking advantage of strong air currents in order to produce electrical energy. On a typical day the wind speed is around 20 mph and in that speed the windmill produces 800 kw/h (kilowatts per hour). On a stormy day a windmill produces 20% more energy. How much kw/h can three windmills produce in two hours on a stormy day?

- (a) 2880.
- (b) 4860.
- (c) 5780.
- (d) 5760.
- (e) 6380.

3. Eric, Nick and Archi make contributions to the Society Of Nature Protection in the ratio of 5:3:2.5. If altogether they contribute 5145 Nis, how much more money does Nick contribute than Archi?

- (a) 128 Nis
- (b) 212 Nis
- (c) 234 Nis
- (d) 245 Nis
- (e) 288 Nis

4. Irene, Ingrid and Nell bake chocolate chip cookies in the ratio of 9.18: 5.17: 2.05. If altogether they baked a batch of 148 cookies, what percent of the cookies did Nell bake?

- (a) 0.125%
- (b) 1.25%
- (c) 12.5%
- (d) 125%
- (e) 0.152%

5. Of 70 players on a football team, 37 are throwers. The rest of the team is divided so one third are left-handed and the rest are right handed. Assuming that all throwers are right handed, how many right-handed players are there total?

- (a) 54
- (b) 59
- (c) 63
- (d) 71
- (e) 92

6. On a map, 1.5 inches represent 24 miles. How many miles approximately is the distance if you measured 47 centimeters assuming that 1-inch is 2.54 centimeters?

- (a) 174.2
- (b) 212
- (c) 288.1
- (d) 296
- (e) 282.4

7. Two trains are traveling on a collision course. If train A is traveling at a speed of 350 mph and train B is traveling 28% slower, how much time will it take the trains to collide if the initial distance between the two is 1505 miles?

- (a) Two hours and 30 minutes.
- (b) One hour and 10 minutes.
- (c) Two hours and 25 minutes.
- (d) Three hours and 15 minutes.
- (e) Four hours and 20 minutes.

8. Two cars are traveling towards each other. If car A is traveling at a speed of 50 mph and car B is traveling 12% slower, how much time will it take the cars to meet if the initial distance between the two is 705 miles?

- (a) Six hours and 30 minutes.
- (b) Seven hours and 30 minutes.
- (c) Eight hours and 20 minutes.
- (d) Nine hours and 15 minutes.
- (e) Ten hours and 20 minutes.

9. If  $(4 \# 2 = 14)$  and  $(2 \# 3 = 6)$ , what can replace  $(a \# b)$ ?

- (a)  $ab$ .
- (b)  $(a+3)b$
- (c)  $a^2 - b$ .
- (d)  $a^b - 2$ .
- (e)  $b^a + 1$ .

10. Monica planned her birthday party. She prepared 5 muffins for each of her guests and kept aside two additional muffins in case someone will want extra. After the

party, it turned out that one of the guests didn't come but every one of the guests that did come ate six muffins and 3 muffins remained. How many guests did Monica plan on?

- 3.
- 4.
- 5.
- 6.
- 7.

11. If "Alfa" is defined as 2 percent of 5 degrees, how many "Alfa's" are there in two circles?

- 0.72.
- 7.2.
- 72.
- 720.
- 7200.

- $3Q/20$ .
- $Q/10$ .
- $5Q/9$ .
- $3Q/10$ .
- $9Q/20$ .

13. The number of bunnies in Peter's yard increases by 4 times every week. How many weeks will it take for the number of bunnies to be divisible by 8 assuming that he started out with 3 bunnies?

- 1.
- 2.
- 3.
- 4.
- Never.

14. A seven-digit phone number is divisible by 3. After adding the two digits of the area code the number is not divisible by 3, which of the following cannot be the area code?

- 06.

02.  
07.  
04.  
05.

15. In a Greek restaurant there is a custom to break plates during celebrations. If after 8 celebrations there were only 6 plates left, which of the following could be the original number of plates before the celebrations?

30.  
32.  
34.  
36.  
40.

16. A cup can hold one third of the amount a bowl can hold. A pot can hold six times more than a cup. How many pots can be filled with a liquid that takes up 6 bowls?

1.  
2.  
3.5.  
4.  
5.5.

17. Michael, Steve and Tyler shared a box of cookies. Michael ate  $\frac{1}{8}$  of the cookies, Steve ate one half and Tyler ate 150 more cookies than Michael. If no cookies remain in the box, how many cookies were in the box?

1200.  
600.  
800.  
400.  
550.

18. An ant walks an average of 500 meters in 12 minutes. A beetle walks 15% less distance at the same time on the average. Assuming the beetle walks at her regular rate, what is its speed in km/h?

2.215.  
2.5.  
2.775.  
3.2.  
3.5.

19. The distance from Steve's house to work is 30 Km. On the way back Steve drives twice as fast as he did on the way to work. Altogether, Steve is spending 6 hours a day on the roads. What is Steve's speed on the way back from work?

10.

- 20.
- 5.
- 14.
- 15.

20. A and B are numbers between 0 and 9. When multiplying 56 by another number the result is 1AB. which of the following can represent A?

- 8.
- 2.
- 6.
- 4.
- 5.

21. Q and R are numbers between 0 and 9. When multiplying 71 by another double-digit number the result is 7PQ. Which of the following could represent Q?

- 1.
- 8.
- 3.
- 5.
- 4.

22. A and B are numbers between 1 and 9. What is  $ABAB/AB$ ?  
(AB is a two-digit number and ABAB is a 4-digit number).

- 11
- BAB
- 101
- AB
- 100.

23. A and B are numbers between 1 and 9. If  $A = 4B$  than by what number is the two digit number BA not divisible?

- 1
- 2
- 7
- 14
- 3

24. A and B are numbers between 1 and 9. If  $A = 4B$  than by what number is the two digit number BA not divisible?

- 1
- 2



7  
14  
3

25. If  $Z$  is a positive integer and  $(192)^5$  is a multiple of  $8^Z$ , what is the largest possible value of  $Z$ ?

5.  
7.  
8.  
10.  
12.

26. Which of the following is the greatest possible common divisor of two different positive integers, both smaller than 124?

123.  
122.  
63.  
62.  
61.

27. How many of the positive divisors of 120 are also multiples of 4 not including 120?

3.  
4.  
5.  
7.  
8.

28. What is the sum of squares of the first two positive odd integers if the sum of squares of the first two positive even integers is  $X$ ?

$X$ .  
 $X/3$ .  
 $X/2$ .  
 $X/6$ .  
 $3X/4$ .

29. A carousel spins at a rate of  $\frac{1}{2}$  a round per second. If a point on its circumference is located 0.5 meters from the center of rotation, how many times approximately will this point reach its starting point in two minutes?

25.

30.  
60.  
120.  
180.

30. Chandler is building a fence in the following method: He grounds 10 poles, each 10 Cm thick, in 1 meter spaces from each other. He then connects the poles with a barbed wire. What is the total length of the fence?

9.9.  
10.  
11.  
12.  
13.

31. What is the sum of all the even numbers bigger than (-10) and smaller than 12?

0.  
2.  
4.  
8.  
10.

Explanations:

1. The best answer is D.

This is a question with a lot of dispensable text, it teaches us to focus on relevant information only. A family car consumes 1 liter for 12 Km, a pickup truck consumes

twice as much, 1 liter for 6 Km. There are 3 additional passengers so the consumption rises by 10%,  $6Km \times 0.9 = 5.4Km$ .

2. The best answer is D.

On a stormy day, a windmill will produce 20% more energy. 20% of 800 is 160, so each windmill will give out 960 kw/h. Three windmills will give  $3 \times 960 = 2880$ , which is answer (a), but we want two hours so the answer is  $2880 \times 2 = 5760$ .

3. The best answer is D.

Add the numbers in the ratio  $5:3:2.5 = 10.5$ . Divide the 5145 by 10.5 and you get the basic

Unit = 490 Nis. Nick contributes 0.5 more units than Archi, and since each unit is 490, he contributed 245 Nis more.

4. The best answer is C.

Add the numbers in the ratio to get  $9.18 + 5.17 + 2.05 = 16.4$ .

You don't need to relate to the number of cookies, it doesn't contribute anything.

The relative part of Nell is  $2.05/16.4 = 0.125 = 12.5\%$

5. The best answer is B.

$70 - 37$  are the rest. Meaning that  $33/3 = 11$  are left-handed. The overall number of right handed:  $37 + 22 = 59$ .

6. The best answer is D.

Dividing the number of centimeters in 2.54 gives you the number of inches:  $47/2.54 = 18.5$  inches. 1.5 inches represent 24 miles, 1 inch represents 16 miles.

$(18.5 \text{ inches}) \times (16 \text{ miles}) = 296 \text{ miles}$ .

7. The best answer is A.

Train B is traveling at a speed of  $0.72 \times 350 = 252 \text{ mph}$ .

The two trains are traveling in opposite directions. Thus, the distance should be divided by the sum of their speeds =  $252 + 350 = 602 \text{ mph}$ .

$1505 \text{ miles} / 602 = 2.5 = \text{two hours and 30 minutes}$ .

8. The best answer is B.

Car B is traveling at a speed of  $0.82 \times 50 = 44 \text{ mph}$ .

The cars are traveling in opposite directions. Thus, the distance should be divided by the sum of their speeds =  $50 + 44 = 94 \text{ mph}$ .

$705 \text{ miles} / 94 = 7.5 = \text{seven hours and 30 minutes}$ .

9. The best answer is D.

Plug in the answers.

(a)  $(4 \# 2) = 8$ . The answer should be 14.

(b)  $(2 \# 3) = (2 + 3)3 = 15$ . The answer should be 6.

(c)  $(2 \# 3) = (2^2 - 3) = 1$ . The answer should be 6.

(d)  $(4 \# 2) = (4^2 - 2) = 14$ . This is the right answer, check  $(2 \# 3)$  also.

10. The best answer is C.

X is the number of guests that were suppose to show up at the party, and so Monica prepared  $5X + 2$  muffins.  $(X - 1)$  is the number of guests that did come to the party and the total number of muffins is  $6(X - 1) + 3$ . The number of muffins that Monica prepared is equal to the total number of muffins and so we can compare the following expressions:  $5X + 2 = 6(X - 1) + 3 \rightarrow X = 5$ .

11. The best answer is E.

“Alfa” is defined as  $(0.02 \times 5 \text{ degrees} = 0.1 \text{ degrees})$ .

In a circle there are 360 degrees, in two circles there are 720.

$(720 \text{ degrees} / 0.1 = 7200 \text{ “Alfa’s”})$  in two complete circles.

12. The best answer is E.

$75Q/100$  is the number of people who eat after 22:00. 60% of that number is the number of people who weren’t asked upon, when do they get up at the morning.

$60 \times (75Q/100) / 100 = 45Q/100 = 9Q/20$ .

13. The best answer is B.

In the beginning he has 3, one week later he has 12 and two weeks later he has 48 and that can be equally divided by 8.

14. The best answer is A.

Adding one number that is divisible by 3 to another, the result will still be a number that is divisible by 3; the only number among the answers that is divisible by 3 is 06.

15. The best answer is A.

Take answer A: start with 30 plates; take out 6 so you have 24.

24 is divisible by 8 (celebrations).

16. The best answer is B.

Try some numbers. One cup can hold 1 liter ~~à~~ one bowl can hold 3 liters, a put can hold 9 liters.

6 bowls hold 18 liters and that can fill up two pots.

17. The best answer is C.

The fastest way is to try the answers, take 600. Michael ate  $(600/8) 75$  cookies, Steve ate 300 and Tyler ate 225. Adding the numbers and you’ll get 600 cookies again.

18. The best answer is A.

A beetle moves ( $0.85 \times 500 = 425$  meters) in 12 minutes  $\Rightarrow$  that is equal to 0.425 Km in  $1/5$  of an hour. The speed in the right units is  $0.425 \times 5 = 2.125$  Km/h.

19. The best answer is E.

Steve's speed on the way back is double the speed to work therefore it takes him half the time to return home  $\rightarrow$  Divide 6 hours by 1:2 ratio, the time it takes him to get home is 2 hours and the time driving to work is 4 hours. 30 Km in 2 hours is 15 Km per hour.

20. The best answer is C.

We have two choices:  $56 \times 2 = 112$  or  $56 \times 3 = 168$ .

Therefore A could be 1 or 6. The answer is A = 6.

21. The best answer is A.

We have two choices:  $71 \times 10 = 710$  or  $71 \times 11 = 781$ .

Therefore Q can be 0 or 1. The answer is A.

22. The best answer is C.

Plug in numbers: A = 1, B = 2  $\Rightarrow$  AB = 12,

ABAB = 1212.  $1212/12 = 101$ .

23. The best answer is C.

You have two choices: 1)  $4 = 4 \times 1$  2)  $8 = 4 \times 2$ .

In the first choice, (BA = 14) can be divided by all the numbers except 3. In the second choice, (BA = 28) can be divided by all the numbers except 3. Therefore, E is the answer.

24. The best answer is C.

You have two choices: 1)  $4 = 4 \times 1$  2)  $8 = 4 \times 2$ .

In the first choice, (BA = 14) can be divided by all the numbers except 3. In the second choice, (BA = 28) can be divided by all the numbers except 3. Therefore, E is the answer.

25. The best answer is D.

Factorize  $(192)^5$  and see what can be the largest value of Z.

$192 = 64 \times 3 = 8 \times 8 \times 3 \rightarrow (192)^5 = (8 \times 8 \times 3)^5 = 3^5 \times 8^{10}$ .

The largest possible value of  $8^Z$  which is a factor of  $(192)^5$  is the largest possible value of Z of which  $8^Z$  is a factor of  $8^{10}$ . Z = 10.

26. The best answer is 61.

A divisor is actually a factor of a number.

Check each of the answers individually:

124 is divisor of itself, but obviously he has no other divisors smaller than 124.

63 is a divisor of itself and 126, which is bigger than 124.

62 is on the limit, we were asked for divisors less than 124.  
This is the right answer. 61 is a divisor of 61 and 122.

27. The best answer is D.

Write down all the factors of 120: 60, 40, 30, 24, 20, 15, 12, 10, 8, 6, 5, 4, 3, 2, 1.  
Among these numbers only the following are multiples of 4: 4, 8, 12, 20, 24, 40 and 60.

28. The best answer is C.

The squares of the first two odd numbers are:  $1^2 + 3^2 = 10$ .

The squares of the first two even numbers are:  $2^2 + 4^2 = 20$ .

29. The best answer is C.

If the carousel spins half a turn in one second then it spins once every two seconds. In two minutes there are 120 seconds and therefore the point will reach its starting point ( $120 / 2 = 60$ ) times, no matter how far it is from the center of the circle.

30. The best answer is B.

The total width of the poles is ( $10 \times 0.1 = 1$ ) meter.

There are 9 spaces between the poles, 1 meter each, so it's another 9 meters. The total length is ( $1 + 9 = 10$ ) meters.

31. The best answer is E.

This is a series of numbers with a constant spacing between them.

The first number is (-8) and the last is (10), there are 10 numbers altogether.

The formula for such a series is:  $((-8 + 10) \times 10) / 2 = 10$ .

The second way to answer such a question is to write the numbers and add them.

1. Which of the following expressions is independent to variable X?

- a)  $(4X - 3) / (X - 3)$ .
- b)  $X - (1 + 2X) / 2$ .
- c)  $4X - 1 - 4(1 - X)$ .
- d)  $(X + 2)^2 - X^2$ .
- e)  $X / (4X) + 4X / 4$ .

2. If  $4XZ + YW = 3$  and  $XW + YZ = 6$ , what is the value of the expression  $(2X + Y)(2Z + W)$ ?

- a) 9.
- b) 18.
- c) 16.

- d) 12.
- e) 15.

3. If  $(A + 2)^2 = (A + 5)^2$ , what could be the value of A?

- a) 1.5.
- b) -2.5.
- c) -3.5.
- d) 2.5
- e) 3.

4. If  $A^2(B + C) = 20$ , (A, B and C are all integers bigger than 1), what is the value of the expression  $(B + C - A)$ ?

- a) 1.
- b) 2.
- c) 3.
- d) 4.
- e) 9.

5. If  $(A-B-C+D = 13)$  and  $(A+B-C-D = 5)$ , what is the value of  $(B-D)^2$ ?

- a) 16.
- b) 64.
- c) 8.
- d) 4.
- e) 12.

6. If  $(A+B) = 4$ ,  $(B+C) = 9$  and  $(C+D) = 3$ , what is the value of  $(A+D)$ ?

- a) -2.
- b) 2.
- c) 7.
- d) 8.
- e) 16.

7. If  $X^2 + Y^2 = A + 3$ ,  $XY = 7$  and  $(X + Y)^2 = 25$ , what is the value of A?

- a) 4.
- b) 5.
- c) 6.
- d) 8.
- e) 11.

8. If  $4-X < (2-5X)/3$ , which of the following is correct?

- a)  $X < -5$ .
- b)  $X > -5$ .
- c)  $X > 5$ .
- d)  $-5 < X < 0$ .
- e)  $0 < X < 5$ .

9. If  $Y < X$  and  $XM < YM$ , what must be true?

- a)  $M < X$ .
- b)  $M < Y$ .
- c)  $X < 0$ .
- d)  $M < 0$ .
- e)  $Y < 0$ .

10. If  $X = (Y/Z)$ ,  $(-1 < Z < 0)$  and  $4 < Y$ , which of the following is correct?

- a)  $X > 4$ .
- b)  $0 < X < 4$ .
- c)  $-4 < X < 0$ .
- d)  $X < -4$ .
- e)  $X < -20$ .

11. If  $(B+A < B-A < A-B)$ , which of the following is correct?

- a)  $A < B < 0$ .
- b)  $B < A < 0$ .
- c)  $B < 0 < A$ .
- d)  $0 < B < A$ .
- e)  $B > A > 0$ .

12. To a prime number bigger than 2, 1 is added, the result is multiplied by three. What can be the result of these actions?

- a) 51.
- b) 54.
- c) 43.
- d) 41.
- e) 53.

13. A, B and C are consecutive integers. If  $X = (A \times B \times C)/2$ , what can be said about X?

- a) X is even.
- b) X is divisible by 3.
- c) X is divisible by 5.
- d) X is positive.
- e) X is a fraction.



14. If  $x = y + 3 + 4.5x$  and  $y = x + 18$ , what is the value of  $x/y$  ?

- a)  $1/4$ .
- b)  $5/6$ .
- c)  $-6/5$ .
- d)  $-7/20$ .
- e)  $1.5$ .

15. If  $X^2 = Y$  and  $Y = 4.5X + 2.5$ , which of the following could be the value of  $y$ ?

- a) 25.
- b) -0.5.
- c) 5.
- d) 10.
- e) 15.5.

16. If  $-3x + 4y = 28$  and  $3x - 2y = 8$ , what is the product of  $x$  and  $y$ ?

- a) 428.
- b) 622.
- c) 464.
- d) 264.
- e) 642.

17. If  $X + Y = 2X - 2Z$ ,  $X - 2Y = 4Z$  and  $X + Y + Z = 21$ , what is the value of  $Y/Z$ ?

- a) -2.
- b) -4.5.
- c) 3.
- d) -1.7.
- e) 2.5.

18. If  $X/Y = 3X$  and  $Y = 4 - X$ , what can be the value of  $2X$ ?

- a) Seven and two thirds.
- b) Three and one third.
- c) Seven and one third.
- d) Two and one third.
- e) Three and two thirds.

Explanations:

1. The best answer is B.

Simplify all the expressions to see where X disappears.

Answer B:  $X - (1+2X)/2 = X - \frac{1}{2} - X = -1/2$  and this answer as you can see is not dependent on the variable X.

2. The best answer is E.

$$(2X + Y)(2Z + W) = 4XZ + 2XW + 2ZY + WY.$$

Now, plug in this data to get:  $3 + 2 \times 6 = 15$ .

3. The best answer is C.

Plug in the answers to back solve this question. Input  $A = -3.5$  and you'll get  $(-1.5)^2 = (1.5)^2$ .

4. The best answer is C.

Because they are all integers bigger than 1, the only multiplication can be  $4 \times 5 = 20$ .  
Because A is an integer,  $A^2$  can't be 5 therefore its 4 ( $A = 2$ ).  $A = 2 \Rightarrow B + C = 5$ .  $B + C - A = 5 - 2 = 3$ .

5. The best answer is A.

Subtract equation 2 from equation 1 and you'll get:  $-2B + 2D = 8 \Rightarrow (B-D)^2 = 16$ .

6. The best answer is A.

Take equation 1 + equation 3 – equation 2 and you'll get  $4 + 3 - 9 = -2$ .

7. The best answer is D.

$A + 3 = X^2 + Y^2 = (X + Y)^2 - 2XY = 25 - 7 \times 2 = 11 \Rightarrow A = 8$ .

8. The best answer is A.

Multiply both sides by 3:  $12 - 3X < 2 - 5X \Rightarrow X < -5$ .

9. The best answer is D.

If  $Y < X$ , multiply both sides by M and see that M must be negative since it changed the sign of the inequality. Remember that multiplying both sides of an inequality by a negative number reverses the direction of the inequality sign.

10. The best answer is D.

Plug in numbers that fit the conditions of the question,  $Y=5$ ;  $Z = -1/2 \Rightarrow X = 5/(-1/2) = -10$ .

11. The best answer is B.

Divide the equation in to two:  $(B+A < B - A)$  and  $(B - A < A - B)$ .

From the first one:  $A < 0$ . From the second one:  $A > B$ . Therefore B is the answer.

12. The best answer is E.

A prime number bigger than 2 must be odd, adding one to that number gives you an even number, multiply that number by 3 and again the result is even. The only even answer is B.

13. The best answer is B.

A product of three consecutive integers is divisible by 6, therefore when divided by 2 it is still divisible by 3.

14. The best answer is D.

Solve two equations with two variables. Put y in the first equation.

We'll get  $x = (x+18)+3+4.5x$ , the value of x is  $-14/3$  and  $y = 40/3$ .  $x/y = -7/20$ .

15. The best answer is A.

$Y=4.5X+2.5$ ,  $x = 5$  or  $-0.5$ . Y can be 25 ( $4.5*5 + 2.5$ ).

16. The best answer is D.

We can notice that adding both equations gives:  $2y = 36$  thus  $y = 18$ .

From one of the equations we can receive:  $x = 44/3$ , so the answer is  $18x \cdot 44/3 = 6x44 = 264$ .

17. The best answer is A.

There are three equations with three variables, the solution is:

$X = 0$ ,  $Y = 42$  and  $Z = -21$  so  $Y/Z$  is  $-2$ .

18. The best answer is C.

With both equations we'll get the following equation:  $x(3x-11) = 0$ . So, X is either 0 or  $11/3$  we want the value of  $2X$ , meaning (c).

1. The average age of Eric and George is 10 years smaller than the average age of Martha and Bella. If Martha is six years older than Eric, how much older is Bella from George?

- a) 2.
- b) 8.
- c) 10.
- d) 12.
- e) 14.

2. The grade point average of the entire class is 90. If the average of one third of the class is 96, what is the average of the rest?

- a) 92.
- b) 88.
- c) 89.
- d) 86.
- e) 87.

3. The average length of 6 snakes is 80 cm. If the average length of one third of the snakes is 70 cm, what is the average of the other snakes?

- a) 75.

- b) 85.
- c) 90.
- d) 100.
- e) 94.

4. There are ten players in the basketball team. If the average height of the players is 170 cm, what will be the new average height if a 192 cm player will join the team?

- a) 181.
- b) 172.2.
- c) 172.
- d) 168.
- e) 184.

5. Gina and Tina's average grade is 23 points higher than Tina's grade. What is the difference between their grades?

- a) 23.
- b) 46.
- c) 16.
- d) 11.5.
- e) 15.

6. There are 7 players in a bowling team with an average weight of 85 Kg. If two new players join the team, one weighs 110 Kg and the second weighs 60 Kg, what will be the new average weight?

- a) 75 Kg.
- b) 80 Kg.
- c) 85 Kg.
- d) 90 Kg.
- e) 92 Kg.

Explanations:

1. The best answer is E.

Write the equation:  $(\text{Eric} + \text{George})/2 - 10 = (\text{Bella} + \text{Martha})/2$  à

$\text{Eric} + \text{George} + 20 = \text{Bella} + \text{Martha}$ ,

The girls are 20 years older than the boys, if one is older only by 6 than the other one has to be older by 14.

2. The best answer is B.

Choose a representative number of students, 3 for example.

Use the average formula:  $(96 + 2X)/3 = 90 \rightarrow 2X = 174 \rightarrow X = 87$ .

3. The best answer is B.

The length of all six snakes is  $6 \times 80 = 480$  cm.

Third of the snakes are by average 70 cm long therefore their sum is 140.

The sum of the length for the remainder of the snakes is  $480 - 140 = 340$ .

$340 / 4$  snakes is 85 cm.

4. The best answer is C.

The new player is  $(192 - 170 = 22)$  cm above average. Dividing the extra height

among 11 players is 2 cm per player, thus the new average height is  $(170 + 2 = 172)$  cm).

5. The best answer is B.

Define T as Tina's grade and G as Gina's grade.

Write the equation,  $T + 23 = (G + T)/2 \Rightarrow 2T + 46 = G + T \Rightarrow T + 46 = G \Rightarrow G - T = 46$ .

6. The best answer is C.

The trick to this question is to notice that the average weight of the two new players is exactly 85 Kg and so when they join the team, the average weight stays the same.

1. In a workshop there are 4 kinds of beds, 3 kinds of closets, 2 kinds of shelves and 7 kinds of chairs. In how many ways can a person decorate his room if he wants to buy in the workshop one shelf, one bed and one of the following: a chair or a closet?

- a) 168.
- b) 16.
- c) 80.
- d) 48.
- e) 56.

2. In a workshop there are 4 kinds of beds, 3 kinds of closets, 2 kinds of shelves and 7 kinds of chairs. In how many ways can a person decorate his room if he wants to buy in the workshop one shelf, one bed and one of the following: a chair or a closet?

- a) 168.
- b) 16.
- c) 80.
- d) 48.
- e) 56.

3. Three people are to be seated on a bench. How many different sitting arrangements are possible if Erik must sit next to Joe?

- a) 2.
- b) 4.
- c) 6.
- d) 8.
- e) 10.

4. How many 3-digit numbers satisfy the following conditions: The first digit is different from zero and the other digits are all different from each other?

- a) 648.
- b) 504.
- c) 576.
- d) 810.
- e) 672.

5. Barbara has 8 shirts and 9 pants. How many clothing combinations does Barbara have, if she doesn't wear 2 specific shirts with 3 specific pants?
- a) 41.
  - b) 66.
  - c) 36.
  - d) 70.
  - e) 56.
6. A credit card number has 6 digits (between 1 to 9). The first two digits are 12 in that order, the third digit is bigger than 6, the fourth is divisible by 3 and the fifth digit is 3 times the sixth. How many different credit card numbers exist?
- a) 27.
  - b) 36.
  - c) 72.
  - d) 112.
  - e) 422.
7. In jar A there are 3 white balls and 2 green ones, in jar B there is one white ball and three green ones. A jar is randomly picked, what is the probability of picking up a white ball out of jar A?
- a)  $\frac{2}{5}$ .
  - b)  $\frac{3}{5}$ .
  - c)  $\frac{3}{10}$ .
  - d)  $\frac{3}{4}$ .
  - e)  $\frac{2}{3}$ .
8. Out of a box that contains 4 black and 6 white mice, three are randomly chosen. What is the probability that all three will be black?
- a)  $\frac{8}{125}$ .
  - b)  $\frac{1}{30}$ .
  - c)  $\frac{2}{5}$ .
  - d)  $\frac{1}{720}$ .
  - e)  $\frac{3}{10}$ .
9. The probability of pulling a black ball out of a glass jar is  $\frac{1}{X}$ . The probability of pulling a black ball out of a glass jar and breaking the jar is  $\frac{1}{Y}$ . What is the probability of breaking the jar?
- a)  $\frac{1}{(XY)}$ .
  - b)  $\frac{X}{Y}$ .
  - c)  $\frac{Y}{X}$ .
  - d)  $\frac{1}{(X+Y)}$ .
  - e)  $\frac{1}{(X-Y)}$ .



10. Danny, Doris and Dolly flipped a coin 5 times and each time the coin landed on “heads”. Dolly bet that on the sixth time the coin will land on “tails”, what is the probability that she’s right?

- a) 1.
- b)  $\frac{1}{2}$ .
- c)  $\frac{3}{4}$ .
- d)  $\frac{1}{4}$ .
- e)  $\frac{1}{3}$ .

11. In a deck of cards there are 52 cards numbered from 1 to 13. There are 4 cards of each number in the deck. If you insert 12 more cards with the number 10 on them and you shuffle the deck really good, what is the probability to pull out a card with a number 10 on it?

- a)  $\frac{1}{4}$ .
- b)  $\frac{4}{17}$ .
- c)  $\frac{5}{29}$ .
- d)  $\frac{4}{13}$ .
- e)  $\frac{1}{3}$ .

12. There are 18 balls in a jar. You take out 3 blue balls without putting them back inside, and now the probability of pulling out a blue ball is  $\frac{1}{5}$ . How many blue balls were there in the beginning?

- a) 9.
- b) 8.
- c) 7.
- d) 12.
- e) 6.

13. In a box there are A green balls,  $3A + 6$  red balls and 2 yellow ones. If there are no other colors, what is the probability of taking out a green or a yellow ball?

- a)  $\frac{1}{5}$ .
- b)  $\frac{1}{2}$ .
- c)  $\frac{1}{3}$ .
- d)  $\frac{1}{4}$ .
- e)  $\frac{2}{3}$ .

14. The probability of Sam passing the exam is  $\frac{1}{4}$ . The probability of Sam passing the exam and Michael passing the driving test is  $\frac{1}{6}$ . What is the probability of Michael passing his driving test?

- a)  $\frac{1}{24}$ .
- b)  $\frac{1}{2}$ .
- c)  $\frac{1}{3}$ .
- d)  $\frac{2}{3}$ .
- e)  $\frac{2}{5}$ .

15. In a blue jar there are red, white and green balls. The probability of drawing a red ball is  $\frac{1}{5}$ . The probability of drawing a red ball, returning it, and then drawing a white ball is  $\frac{1}{10}$ . What is the probability of drawing a white ball?

- a)  $\frac{1}{5}$ .
- b)  $\frac{1}{2}$ .
- c)  $\frac{1}{3}$ .
- d)  $\frac{3}{10}$ .
- e)  $\frac{1}{4}$ .

16. Out of a classroom of 6 boys and 4 girls the teacher picks a president for the student board, a vice president and a secretary. What is the probability that only girls will be elected?

- a)  $\frac{8}{125}$ .
- b)  $\frac{2}{5}$ .
- c)  $\frac{1}{30}$ .
- d)  $\frac{1}{720}$ .
- e)  $\frac{13}{48}$ .

17. Two dice are rolled. What is the probability the sum will be greater than 10?

- a)  $\frac{1}{9}$ .
- b)  $\frac{1}{12}$ .
- c)  $\frac{5}{36}$ .
- d)  $\frac{1}{6}$ .
- e)  $\frac{1}{5}$ .

18. The probability of having a girl is identical to the probability of having a boy. In a family with three children, what is the probability that all the children are of the same gender?

- a)  $\frac{1}{8}$ .
- b)  $\frac{1}{6}$ .
- c)  $\frac{1}{3}$ .
- d)  $\frac{1}{5}$ .
- e)  $\frac{1}{4}$ .

19. On one side of a coin there is the number 0 and on the other side the number 1. What is the probability that the sum of three coin tosses will be 2?

- a)  $\frac{1}{8}$ .
- b)  $\frac{1}{2}$ .
- c)  $\frac{1}{5}$ .
- d)  $\frac{3}{8}$ .
- e)  $\frac{1}{3}$ .

20. In a flower shop, there are 5 different types of flowers. Two of the flowers are blue, two are red and one is yellow. In how many different combinations of different colors can a 3-flower garland be made?

- a) 4.
- b) 20.
- c) 3.
- d) 5.
- e) 6.

21. In a jar there are balls in different colors: blue, red, green and yellow.

The probability of drawing a blue ball is  $\frac{1}{8}$ .

The probability of drawing a red ball is  $\frac{1}{5}$ .

The probability of drawing a green ball is  $\frac{1}{10}$ .

If a jar cannot contain more than 50 balls, how many yellow balls are in the Jar?

- a) 23.
- b) 20.
- c) 24.
- d) 17.
- e) 25.

- a)  $\frac{9}{10}$
- b)  $\frac{16}{20}$
- c)  $\frac{2}{5}$
- d)  $\frac{3}{5}$
- e)  $\frac{1}{2}$

23. In Rwanda, the chance for rain on any given day is 50%. What is the probability that it rains on 4 out of 7 consecutive days in Rwanda?

- a)  $\frac{4}{7}$
- b)  $\frac{3}{7}$
- c)  $\frac{35}{128}$
- d)  $\frac{4}{28}$
- e)  $\frac{28}{135}$

24. A Four digit safe code does not contain the digits 1 and 4 at all. What is the probability that it has at least one even digit?

- a)  $\frac{1}{4}$
- b)  $\frac{1}{2}$
- c)  $\frac{3}{4}$
- d)  $\frac{15}{16}$
- e)  $\frac{1}{16}$

25. John wrote a phone number on a note that was later lost. John can remember that the number had 7 digits, the digit 1 appeared exactly 3 times and 0 did not appear at all. What is the probability that the phone number contains at least two prime digits?

- a)  $15/16$
- b)  $11/16$
- c)  $11/12$
- d)  $\frac{1}{2}$
- e)  $5/8$

26. What is the probability for a family with three children to have a boy and two girls (assuming the probability of having a boy or a girl is equal)?

- a)  $1/8$
- b)  $\frac{1}{4}$
- c)  $\frac{1}{2}$
- d)  $3/8$
- e)  $5/8$

27. In how many ways can you sit 8 people on a bench if 3 of them must sit together?

- a) 720
- b) 2,160
- c) 2,400
- d) 4,320
- e) 40,320

28. In how many ways can you sit 7 people on a bench if Suzan won't sit on the middle seat or on either end?

- a) 720
- b) 1,720
- c) 2,880
- d) 5,040
- e) 10,080

29. In a jar there are 15 white balls, 25 red balls, 10 blue balls and 20 green balls. How many balls must be taken out in order to make sure we took out 8 of the same color?

- a) 8
- b) 23
- c) 29
- d) 32
- e) 53

30. In a jar there are 21 white balls, 24 green balls and 32 blue balls. How many balls must be taken out in order to make sure we have 23 balls of the same color?

- a) 23
- b) 46
- c) 57
- d) 66
- e) 67

31. What is the probability of getting a sum of 12 when rolling 3 dice simultaneously?

- a)  $10/216$
- b)  $12/216$
- c)  $21/216$
- d)  $23/216$
- e)  $25/216$

32. How many diagonals does a polygon with 21 sides have, if one of its vertices does not connect to any diagonal?

- a) 21
- b) 170
- c) 340
- d) 357
- e) 420

33. How many diagonals does a polygon with 18 sides have if three of its vertices do not send any diagonal?

- a) 90
- b) 126
- c) 210
- d) 264
- e) 306

34. What is the probability of getting a sum of 8 or 14 when rolling 3 dice simultaneously?

- a)  $1/6$
- b)  $1/4$
- c)  $1/2$
- d)  $21/216$
- e)  $32/216$

35. The telephone company wants to add an area code composed of 2 letters to every phone number. In order to do so, the company chose a special sign language containing 124 different signs. If the company used 122 of the signs fully and two remained unused, how many additional area codes can be created if the company uses all 124 signs?

- a) 246
- b) 248
- c) 492
- d) 15,128
- e) 30,256

36. How many 8-letter words can be created using computer language (0/1 only)?

- a) 16
- b) 64
- c) 128
- d) 256
- e) 512

37. How many 5 digit numbers can be created if the following terms apply: the leftmost digit is even, the second is odd, the third is a non even prime and the fourth and fifth are two random digits not used before in the number?

- a) 2520
- b) 3150
- c) 3360
- d) 6000
- e) 7500

- a)  $\frac{1}{8}$
- b)  $\frac{1}{4}$
- c)  $\frac{1}{2}$
- d)  $\frac{3}{8}$
- e)  $\frac{7}{12}$

39. Ruth wants to choose 4 books to take with her on a camping trip. If Ruth has a total of 11 books to choose from, how many different book quartets are possible?

- a) 28
- b) 44
- c) 110
- d) 210
- e) 330

40. A computer game has five difficulty levels. In each level you can choose among four different scenarios except for the first level, where you can choose among three scenarios only. How many different games are possible?

- a) 18
- b) 19
- c) 20
- d) 21
- e) None of the above

41. How many four-digit numbers that do not contain the digits 3 or 6 are there?

- a) 2401
- b) 3584
- c) 4096
- d) 5040
- e) 7200

42. How many five-digit numbers are there, if the two leftmost digits are even, the other digits are odd and the digit 4 cannot appear more than once in the number?

- a) 1875
- b) 2000
- c) 2375
- d) 2500
- e) 3875

43. In a department store prize box, 40% of the notes give the winner a dreamy vacation; the other notes are blank. What is the approximate probability that 3 out of 5 people that draw the notes one after the other, and immediately return their note into the box get a dreamy vacation?

- a) 0.12
- b) 0.23
- c) 0.35
- d) 0.45
- e) 0.65

Explanations:

1. The best answer is C.

You must multiply your options to every item.  $(2 \text{ shelves}) \times (4 \text{ beds}) \times (3 \text{ closets} + 7 \text{ chairs}) = 80$  possibilities.

2. The best answer is C.

You must multiply your options to every item.  $(2 \text{ shelves}) \times (4 \text{ beds}) \times (3 \text{ closets} + 7 \text{ chairs}) = 80$  possibilities.

3. The best answer is B.

Treat the two who must sit together as one person. You have two possible sitting arrangements. Then remember that the two that sit together can switch places. So you have two times two arrangements and a total of four.

4. The best answer is C.

For the first digit you have 9 options (from 1 to 9 with out 0), for the second number you have 9 options as well (0 to 9 minus the first digit that was already used) and for the third digit you have 8 options left.

So the number of possibilities is  $9 \times 9 \times 8 = 648$ .

5. The best answer is D.

There are  $(8 \times 9) 72$  possibilities of shirts + pants.  $(2 \times 3) 6$  Of the combinations are not allowed. Therefore, only  $(72 - 6) 66$  combinations are possible.

6. The best answer is A.

First digit is 1, the second is 2, the third can be (7,8,9), the forth can be (3,6,9), the fifth and the sixth are dependent with one another. The fifth one is 3 times bigger than the sixth one, therefore there are only 3 options there: (1,3), (2,6), (3,9).

All together there are:  $1 \times 1 \times 3 \times 3 \times 3 = 27$  options.

7. The best answer is C.

The probability of picking the first jar is  $\frac{1}{2}$ , the probability of picking up a white ball out of jar A



Is  $3/(3+2) = 3/5$ . The probability of both events is  $1/2 \times 3/5 = 3/10$ .

8. The best answer is B.

The probability for the first one to be black is:  $4/(4+6) = 2/5$ .

The probability for the second one to be black is:  $3/(3+6) = 1/3$ .

The probability for the third one to be black is:  $2/(2+6) = 1/4$ .

The probability for all three events is  $(2/5) \times (1/3) \times (1/4) = 1/30$ .

9. The best answer is B.

Let Z be the probability of breaking the jar, therefore the probability of both events happening is  $Z \times (1/X) = (1/Y)$ .  $Z = X/Y$ .

10. The best answer is B.

The probability of the coin is independent on its previous outcomes and therefore the probability for "head" or "tail" is always  $1/2$ .

11. The best answer is A.

The total number of cards in the new deck is  $12 + 52 = 64$ .

There are  $(4 + 12 = 16)$  cards with the number 10.

The probability of drawing a 10 numbered card is  $16/64 = 1/4$ .

12. The best answer is E.

After taking out 3 balls there are 15 left.  $15/5 = 3$  blue balls is the number of left after we took out 3 therefore there were 6 in the beginning.

13. The best answer is D.

The number of green and yellow balls in the box is  $A+2$ .

The total number of balls is  $4A + 8$ .

The probability of taking out a green or a yellow ball is  $(A+2)/(4A+8)=1/4$ .

14. The best answer is D.

Indicate A as the probability of Michael passing the driving test.

The probability of Sam passing the test is  $1/4$ , the probability of both events happening together is  $1/6$  so:  $1/4 \times A = 1/6$  therefore  $A = 2/3$ .

15. The best answer is B.

Indicate A as the probability of drawing a white ball from the jar.

The probability of drawing a red ball is  $1/5$ .

The probability of drawing both events is  $1/10$  so,  $1/5 \times A = 1/10$ .

Therefore  $A = 1/2$ .

16. The best answer is C.

The basic principle of this question is that one person can't be elected to more than one part, therefore when picking a person for a job the "inventory" of remaining people is growing smaller.

The probability of picking a girl for the first job is  $4/10 = 2/5$ .

The probability of picking a girl for the second job is  $(4-1)/(10-1) = 3/9$ .

The probability of picking a girl for the third job is  $(3-1)/(9-1) = 1/4$ .

The probability of all three events happening is:  $2/5 \times 3/9 \times 1/4 = 1/30$ .

17. The best answer is B.

When rolling two dice, there are 36 possible pairs of results ( $6 \times 6$ ).

A sum greater than 10 can only be achieved with the following combinations: (6,6), (5,6), (6,5).

Therefore the probability is  $3/36 = 1/12$ .

18. The best answer is E.

The probability for the second child to be of the same gender as the first is:  $1/2$ . The same probability goes for the third child. Therefore the answer is  $1/2 \times 1/2 = 1/4$ .

19. The best answer is D.

The coin is tossed three times therefore there are 8 possible outcomes

( $2 \times 2 \times 2$ ). We are interested only in the three following outcomes:

(0,1,1), (1,0,1), (1,1,0).

The probability requested is  $3/8$ .

20. The best answer is A.

We want to make a 3-flower garlands, each should have three colors of flowers in it.

There are two different types of blue and two different types of red.

The options are (2 blue)  $\times$  (2 red)  $\times$  (1 yellow) = 4 options.

21. The best answer is A.

If  $1/8$  is the probability of drawing a blue ball then there are  $40/8 = 5$  blue balls in the jar. And with the same principle there are 8 red balls and 4 green ones.  $40 - 5 - 8 - 4 = 23$  balls (yellow is the only color left).

22. The best answer is A.

Since we want to draw at least one red ball we have four different possibilities:

1. Drawing blue-blue.
2. Drawing blue-red.
3. Drawing red-blue.

4. Drawing red-red.

There are two ways to solve this question:

One minus the probability of getting no red ball (blue-blue):

$$1 - 2/5 \times 1/4 = 1 - 2/20 = 18/20 = 9/10$$

Or summing up all three good options:

$$\text{Red-blue} \rightarrow 3/5 \times 2/4 = 6/20.$$

$$\text{Blue-red} \rightarrow 2/5 \times 3/4 = 6/20.$$

$$\text{Red-red} \rightarrow 3/5 \times 2/4 = 6/20.$$

$$\text{Together} = 18/20 = 9/10.$$

23. The best answer is C.

We have  $7!/(4! \cdot 3!) = 35$  different possibilities for 4 days of rain out of 7 consecutive days (choosing 4 out of seven). Every one of these 35 possibilities has the following probability: every day has the chance of  $1/2$  to rain so we have 4 days of  $1/2$  that it will rain and 3 days of  $1/2$  that it will not rain. We have  $1/2$  to the power of 7 =  $1/128$  as the probability of every single event. The total is  $35 \times 1/128 = 35/128$ .

24. The best answer is D.

For every digit we can choose out of 8 digits (10 total minus 1 and 4). There are four different options:

5. No even digits
6. One even digit.
7. Two even digits.
8. Three even digits.
9. Four even digits.

The probability of choosing an odd (or an even) digit is  $1/2$ .

One minus the option of no even digits:  $1 - (1/2)^4 = 15/16$ .

You can also sum up all of the other options (2-5).

25. The best answer is B.

Since 1 appears exactly three times, we can solve for the other four digits only. For every digit we can choose out of 8 digits only (without 1 and 0). Since we have 4 prime digits (2, 3, 5, 7) and 4 non-prime digits (4, 6, 8, 9), the probability of choosing a prime digit is  $1/2$ .

We need at least two prime digits:

One minus (the probability of having no prime digits + having one prime digit):

There are 4 options of one prime digit, each with a probability of  $(1/2)^4$ .

There is only one option of no prime digit with a probability of  $(1/2)^4$ .

$$\text{So: } [1 - ((1/2)^4 + (1/2)^4 \cdot 4)] = 11/16.$$

26. The best answer is D.

There are three different arrangements of a boy and two girls: (boy, girl, girl), (girl, boy, girl), (girl, girl, boy). Each has a probability of  $(1/2)^3$ . The total is  $3 \cdot (1/2)^3 = 3/8$ .

Treat the three that sit together as one person for the time being. Now, you have only 6 people (5 and the three that act as one) on 6 places:  $6! = 720$ . Now, you have to remember that the three that sit together can also change places among themselves:  $3! = 6$ . So, The total number of possibilities is  $6! * 3! = 4320$ .

28. The best answer is C.

First, check Suzan: she has 4 seats left (7 minus the one in the middle and the two ends), After Suzan sits down, the rest still have 6 places for 6 people or  $6!$  Options to sit. The total is Suzan and the rest:  $4 * 6! = 2880$ .

29. The best answer is C.

The worst case is that we take out seven balls of each color and still do not have 8 of the same color. The next ball we take out will become the eighth ball of some color and our mission is accomplished.

Since we have 4 different colors:  $4 * 7 (\text{of each}) + 1 = 29$  balls total.

Of course you could take out 8 of the same color immediately, however we need to make sure it happens, and we need to consider the worst-case scenario.

30. The best answer is D.

The worst case would be to take out 21 white balls, 22 green and 22 blue balls and still not having 23 of the same color. Take one more ball out and you get 23 of either the green or the blue balls. Notice that you cannot get 23 white balls since there are only 21, however, you must consider them since they might be taken out also.

The total is:  $21 + 22 + 22 + 1 = 66$ .

32. The best answer is B.

We have 20 vertices linking to 17 others each: that is  $17 * 20 = 340$ . We divide that by 2 since every diagonal connects two vertices.  $340 / 2 = 170$ . The vertex that does not connect to any diagonal is just not counted.

33. The best answer is A.

We have 15 Vertices that send diagonals to 12 each (not to itself and not to the two adjacent vertices).  $15 * 12 = 180$ . Divide it by 2 since any diagonal links 2 vertices = 90.

The three vertices that do not send a diagonal also do not receive any since the same diagonal is sent and received. Thus they are not counted.

34. The best answer is A.

The options for a sum of 14: (6,4,4) has 3 options, (6,5,3) has 6 options, (6,6,2) has 3 options, (5,5,4) has 3 options. We have 15 options to get 14.

The options for a sum of 8: (6,1,1) has 3 options, (5,2,1) has 6 options, (4,3,1) has 6 options, (4,2,2) has 3 options, (3,3,2) has 3 options. We have 21 options to get 8.

Total:  $21+15=36/216 = 1/6$ .

35. The best answer is C.

The phone company already created  $122*122$  area codes, now it can create  $124*124$ .  $124^2 - 122^2 = (124+122)(124-122) = 246*2 = 492$  additional codes.

There are other ways to solve this question. However this way is usually the fastest.

36. The best answer is D.

Every letter must be chosen from 0 or 1 only. This means we have two options for every word and  $2^8 = 256$  words total.

37. The best answer is A.

The first digit has 4 options (2,4,6,8 and not 0), the second has 5 options (1,3,5,7,9) the third has 3 options (3,5,7 and not 2), the fourth has 7 options (10-3 used before) and the fifth has 6 options (10-4 used before). The total is  $4*5*3*7*6=2520$ .

38. The best answer is C.

Getting three red out of 4 that are taken out has 4 options ( $4!/(3!*1!)$ ) each option has a probability of  $(1/2)^4$  since drawing a red or blue has a 50% chance.  $4*1/16 = 1/4$  to get three red hats. The same goes for three blue hats so  $1/4 + 1/4 = 1/2$ .

39. The best answer is E.

Choosing 4 out of 11 books is:  $11!/(4!*7!) = 330$  possibilities.

40. The best answer is .

On four levels there are 4 scenarios = 16 different games. The first level has 3 different scenarios. The total is 19 scenarios.

41. The best answer is B.

The first digit has 7 possibilities (10 – 0,3 and 6). The other three digits have 8 possibilities each.  $7*8*8*8 = 3584$ .

42. The best answer is C.

43. The best answer is B.

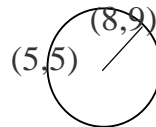
The chance of winning is 0.4 and it stays that way for all people since they return their note. The number of different options to choose 3 winners out of 5 is  $5!/(3!*2!) = 10$ . Each option has a chance of  $0.4*0.4*0.4*0.6*0.6 = 0.02304 * 10 = 0.2304$ .

1. In a rectangular coordinate system, what is the area of a triangle whose vertices have the coordinates (4, 0), (6, 3), and (6, -3)?

- (a) 7.5
- (b) 7
- (c) 6.5
- (d) 6
- (e) 5.5

2. In a rectangular coordinate system, what approximately is the area of a circle whose center is at (5, 5) and a point on its circumference is at (8, 9)?

- (a) 60
- (b) 63
- (c) 68
- (d) 79
- (e) 82



3. In a rectangular coordinate system, what is the area of a rectangle whose vertices have the coordinates (-4, 1), (1, 1), (1, -3) and (-4, -3)?

- (a) 16
- (b) 20
- (c) 24
- (d) 25
- (e) 30

4. In a rectangular coordinate system, what is the area of a rhombus whose vertices have the coordinates (0, 3.5), (8, 0), (0, -3.5), (-8, 0)?

- (a) 56
- (b) 88
- (c) 112
- (d) 116
- (e) 120

- (a) 7.5
- (b) 9
- (c) 10.22
- (d) 12.25
- (e) 14

Explanations:

1. The best answer is D.

First draw the x and y-axes, then plot the points and connect them. The length of the base is 6 units [from (6, 3) to (6, -3)] and the height is 2 units [from (6, 0) to (4, 0)].

Area of a triangle =  $(\text{base} \times \text{height}) / 2$ , so  $(6 \times 2)/2$  is 6.

2. The best answer is A.

First draw the x and y axes, then plot the points and connect them. The distance between the two points is the radius. Use Pythagoras rule to find R.  $R^2 = 3^2 + 4^2 \Rightarrow R = 5$

Area of a circle is:  $p \cdot 5^2 \cong 79$ .

3. The best answer is B.

First draw the x and y axes, then plot the points and connect them, right away you can see that the base is 5 units and the height is 4 units. The area of the rectangle is 20.

4. The best answer is A.

First draw the x and y axes, then plot the points and connect them. The area of a rhombus is simply the product of its diagonals divided by 2.

The area is  $= 16 \times 7 = 112/2 = 56$ .

5. The best answer is B.

Draw the x and y-axes, then plot the points and connect them.

The area of a trapezoid is  $(\text{base}_1 + \text{base}_2) \times (\text{height}) / 2$ .

$\text{Base}_1 = 5$ ,  $\text{base}_2 = 4$ ,  $\text{height} = 18$  thus the area is  $9 \times 9 = 81$ .

The answer to the question is the positive square root of 81, meaning 9.

1. Which of the following is equivalent to  $(4-X)^2 < (X-2)^2$  ?

- a)  $X > 3$ .
- b)  $X < 3$ .
- c)  $X > 0$ .
- d)  $X \geq 3$ .
- e)  $0 < X < 3$ .

2. If  $|X| + |X+3| < 5$ , which of the following is ALWAYS true?

- a)  $X > 3$ .
- b)  $X < 1$ .
- c)  $0 < X < 1$ .
- d)  $X > -4$ .
- e)  $0 < X < 9$ .

3. A and B are negative numbers. Which of the following statements must be true?



- a)  $A^2 - B < 0$ .
- b)  $A^3 / |B| < B^2 / |A^3|$ .
- c)  $|B^3| - |A| > 0$ .
- d)  $|AB| * |A-B| > 0$ .
- e)  $A / B < B / A$ .

4. If  $-X^2 < -1$ , which of the following is always true?

- a)  $|X| < 1$ .
- b)  $X > -1$ .
- c)  $|X| < 0$ .
- d)  $|X| > 1$ .
- e)  $X < -1$ .

5. If  $|A| \times |B| < 1$ , and  $A^2B > 0$ , which of the following is ALWAYS true?

- a) A and B have different signs.
- b) A and B have the same sign.
- c)  $A < 1$  and  $B < 1$ .
- d)  $A / |A| = 1$ .
- e)  $B / |B| = 1$ .

6. Which of the following is equivalent to  $\sqrt{X+2} \geq X$  ?

- a)  $-2 \leq X \leq 2$ .
- b)  $X \leq -2$ , or  $X \geq 2$ .
- c)  $X \geq -2$ .
- d)  $X \leq 2$ .
- e)  $X \neq 2$ .

7. If  $B^3A^2 < 0$ , which of the following cannot be true?

- a)  $A / B > 1$
- b)  $A / B < 1$
- c)  $A - B < A + B$
- d)  $A - B > B - A$
- e)  $A + B = 0$

8.  $-0.5 < X < 0.5$  and  $Y < 11$ . Which of the following cannot be the value of  $XY$ ?

- a) -8.

- b) -1.
- c) 0.
- d) 6.
- e) None of the above.

9. A, B and C are numbers that follow the rule:  $A < B < C$ . which of the following must be true?

- a)  $(A+B) / C < 1$ .
- b)  $(C-B) / A > 0$ .
- c)  $-|C| / AB < 0$ .
- d)  $B|C| > A|B|$ .
- e) None of the above.

10. If  $|A/B| < 1$ , which of the following cannot be true?

- a)  $A < B, A < 0$ .
- b)  $B > 0, A < 0$ .
- c)  $A < B < 0$ .
- d)  $A = 1$ .
- e)  $B = 1$ .

11. Which of the following doesn't always follow the rule  $|X^2 - 4X| < 5$ ?

- a)  $-1 < X < 0$
- b)  $-1 < X < 5$
- c)  $X = 0$
- d)  $X = 4$
- e)  $X = 5$

12. If  $X = 0.1$  and  $Y = 0.2$ , which of the following cannot be true?

- a)  $X^3 / Y^2 < Y^2 / X^3$ .
- b)  $|X-Y|^3 < XY$ .
- c)  $\sqrt{X+2Y} > 0.001$ .
- d)  $\sqrt{Y^2 - X} < Y^{X-3} X^{Y-X}$ .
- e)  $XY = Y^2/2$ .

13. A and B are non-negative, even numbers.  $A/B < 1$ . Which of the following must be true?

- a)  $4^A - 2^B > 0$ .
- b)  $-(3^B) / (-3)^A < -1$ .
- c)  $-(A^B) / B^A < 1$ .
- d)  $B^2 / |A| < 1$ .
- e)  $-3^B - (-6^A) > 0$ .

14. If  $1/A > 1/B > 0$ , which of the following might be true?

- a)  $B^2 - A^2 < -1$ .
- b)  $(B+A) / (B-A) < -1$ .
- c)  $(2/A) - B^2 > AB$ .
- d)  $(B/A)^2 < A/B$ .
- e) None of above.

15. X and Y have different signs, and  $X > Y$ . Which of the following is the smallest?

- a)  $X^3 / Y^{14}$ .
- b)  $-(X-Y) / Y^{17}$ .
- c)  $[(Y-13X) / -X] + Y^2$ .
- d)  $[Y^{12} / -(X-Y)] - X^5$ .
- e)  $(XY)^2 + Y^6$ .

16. Which of the following does not follow the rule  $\frac{|X-1| - |X-3|}{\sqrt{5-X^3}} > 0$ ?

- a)  $-124 < X < -7$ .
- b)  $-24 < X < -15$ .
- c)  $-67 < X < 0$ .
- d)  $X < -68$ .
- e)  $X > 0$ .

17. A and B are negative numbers. Which of the following is always true?

- a)  $B^2 - A^6 > 0$
- b)  $B/A + Y < 0$
- c)  $A^4/B + A/2 < 0$
- d)  $B - 2A > 0$
- e)  $A^2 > B^4 - A$

18. If  $A < -1 < B < 0$ , which of the following must be true?

- a)  $1/A < 1/B$ .

- b)  $B^2 + A < 0$ .
- c)  $1/B < A$ .
- d)  $(1/B)^2 < A^2$ .
- e)  $2B < A$ .

19. If  $A+B = 0.7$  and  $AB < 0$ , which of the following isn't necessarily true?

- a)  $A^2 - 0.7 < -B(2A + B)$ .
- b)  $B^2 - A^2 > 0$ .
- c)  $A > 0.35 - B$ .
- d)  $|A| + |B| > 0.7$ .
- e) None of above.

20. If  $A^2 > (B - 0.6) / 4$  and  $B > 0$ , you can conclude that: ?

- a)  $16A^4 + 0.36 > B^2$ .
- b)  $A^2 - 4B + 0.6 > B$ .
- c)  $4A > \sqrt{B - 0.6}$ .
- d)  $B < 0.6$ .
- e)  $A > 0$ .

21. If  $X$  and  $Y$  have different signs, which of the following cannot be true?

- a)  $X^2 < (Y^4 - 0.25) / 3X$ .
- b)  $|Y| + X^3 < -1$ .
- c)  $3 / XY > 1$ .
- d)  $Y^2/5 < X^2$ .
- e)  $X - Y < 1/Y$ .

22. Which of the following doesn't fit the rule:  $\frac{X^2 - |X| - 12}{X - 3} \geq 2X$  ?

- a)  $-3 < X < 0$ .
- b)  $0 < X < 4$ .
- c)  $X < 0$ .
- d)  $X < 1$ .
- e)  $X < 2$ .

23. What is the total price of two candies, if the cheaper one costs less than 32 cents and the other is 2 times more expensive?

- a) Less than 32 cents.
- b) Less than 48 cents.
- c) Less than 96 cents.
- d) More than 48 cents.
- e) More than 96 cents.

24. A, B and C are three sequential integers that follow the rules:  $ABC < 0$  and  $A < B < C$ . Which of the following might be true?

- a)  $A > -3$ .
- b)  $B/C^2 < A - B$ .
- c)  $B^2A > C^2(B-A)$ .
- d)  $AB < 0$ .
- e)  $AB/2C > 1$ .

25. If  $X-Y$  is positive,  $X$  and  $Y$  have the same sign. Which of the following must be true?

- a)  $X^2 > Y^2$ .
- b)  $Y^2 > XY$ .
- c)  $1/Y > 1/X$ .
- d)  $1/Y^2 > 1/X^2$ .
- e)  $XY > 0$ .

26.  $Z$  is a negative, even number. Which of the following is the greatest? **fix**

- a)  $Z^{z-1}$ .
- b)  $Z^{2|z-1|}$ .
- c)  $Z^{2(z-1)}$ .
- d)  $Z^z$ .
- e)  $3Z^z$ .

27. If  $-1 < X < 0$ , which of the following is the smallest?

- a)  $X^3$ .
- b)  $-X^3$ .
- c)  $1/X$ .
- d)  $(1/X^{-3})^{-3}$ .
- e)  $(1/X^{-4})^{-3}$ .

28.  $A > 0.5$  and  $B < 0.25$ . Which of the following must be true?

- a)  $A^2 > B^2$ .
- b)  $A + B^2 < 0.75$ .
- c)  $A/B > 1$ .
- d)  $A^2B^2 < 1$ .
- e)  $2B < A$ .

29. Which of the following is equivalent to  $|X| + |X+3| < 5$ ?

- a)  $-5 < X < 3$
- b)  $-4 < X < 1$
- c)  $X < -3$
- d)  $X < 1$
- e)  $X > -1$

30. If  $X^2 < 1/Y$ , which of the following might be true?

- a) If  $X > 0$  then  $1/X > Y$ .
- b) If  $X < 0$  then  $1/X > Y$ .
- c) If  $Y < 0$  then  $X > 0$ .
- d) If  $Y < 0$  then  $X = 0$ .
- e) If  $X = Y$  then  $Y > 1$ .

31.  $1/3 < A < 6/7$  and  $0.5 < B < 8/5$ . Which of the following might be  $AB$ ?

- a)  $1 \frac{1}{2}$ .
- b)  $1 \frac{2}{5}$ .
- c)  $\frac{1}{2}$ .
- d)  $\frac{1}{6}$ .
- e)  $\frac{1}{8}$ .

32. If  $|X| > 1$ . Which of the following is the greatest?

- a)  $(1/X)^4$ .
- b)  $(1/X)^{-2}$ .
- c)  $1/X - X^2$ .
- d)  $X^{-6}(X^{-3}/X^4)^{-0.5} - X$ .
- e)  $|X|$ .

33. A ship can carry a cargo of 25.5 tons, and have a room for no more than 17 containers. What is the weight of each container, if all the containers are equal?

- a) Less than 1.5 tons.
- b) Less than 2 tons.
- c) Exactly 2.5 tons.
- d) More than 1.5 tons.
- e) More than 2 tons.

34. The phrase  $1-(A^{-1}B)$  is negative only if:

- a)  $A < 0$  and  $B < 0$ .
- b)  $B > A$  and  $AB > 0$ .
- c)  $B^{-1} < A$  and  $AB > 0$ .
- d)  $A+B > 1$ .
- e)  $AB > 1$ .

35. Which of the following fit the rule:  $\sqrt{9X - 20} < X$  ?

- a)  $X < 0$ .
- b)  $X > 0$ .
- c)  $X > 5$ .
- d)  $X = 0$ .
- e)  $X < 20/9$ .

36. If  $A^3 > B^3$ , what must be true?

- a)  $A^2 > B^2$ .
- b)  $AB > 0$ .
- c)  $A^2 > B^3$ .
- d)  $B^3 > A^2$ .
- e)  $A > B$ .

37. The phrase  $(A+B)^2 \geq 2AB$  is true only for:

- a)  $AB > 0$ .
- b)  $AB < 0$ .
- c)  $A+B > 0$ .
- d) Any A and B.
- e) Never.

38. If  $1/X < 1$  and  $1/Y > -1$ , which of the following must be true when Y is an integer?

- a)  $Y^2 - X^{-1} > 0$ .
- b)  $Y^2 < X^2$ .
- c)  $Y^3 + X^3 > 0$ .
- d)  $1/(XY) > 1/X + 1/Y$ .
- e)  $|Y| < |X|$ .

39. The lottery price is greater than 10 million dollars and smaller than 35 million dollars, and is divided to 2 people or more, but no more than 10 people. What is the sum of money that each one of them gets?

- a) More than 10 million, less than 35 million.
- b) More than 100,000, less than 3.5 million.
- c) More than 1 million, less than 17.5 million.
- d) More than 1 million, less than 3.5 million.
- e) More than 3.5 million, less than 5 million.

40. If  $AB < 0$  and  $A + B = 4/6$ . Which of the following must be true?

- a)  $A^2 > B^2$ .
- b)  $|6A| > 4 - |6B|$
- c)  $|A| - 1 > |B| - 2/6$
- d)  $A > B$
- e)  $B > A^2$

Explanations:

1. The best answer is A.

After opening the brackets we get:  $X^2 - 8X + 16X < X^2 - 4X + 4$

2. The best answer is C.

In each answer, put the end points (including infinities) instead of X. In A, B and D, one of the end points is infinity, and we can easily see that infinity is a wrong answer.

3. The best answer is B.

$A^3$  is a negative number, but  $B^2$  is a positive number. Both  $|B|$  and  $|A^3|$  are positive numbers.

4. The best answer is D.

If  $-X^2 < -1$  then  $X^2 > 1$ , and therefore:  $X > 1$  or  $X < -1$ . In other words:  $|X| > 1$ .



5. The best answer is E.

Since  $A^2$  is always positive, B must be positive too ( $A^2B > 0$ ).

6. The best answer is A.

Answers B to D contain infinities. Putting infinity instead of X won't give us a right answer. E is wrong since we can easily see that putting 2 instead of X is a right answer.

7. The best answer is C.

If  $B^3A^2$  is negative, B must be negative (A can be negative or positive), Therefore  $-B$  is greater than B.

8. The best answer is E.

Y can be ANY number that is smaller than 11, to minus infinity, And X can be either negative or positive. The multiplication of them can be any number.

9. The best answer is E.

Since each of the numbers can be either negative or positive, and still follow the rule  $A < B < C$ , it's impossible to conclude anything about their relationship.

10. The best answer is C.

If both of the numbers are negative and  $A < B$ , the absolute value of A is GREATER than the absolute value of B, therefore the division  $A/B$  is a positive value that is GREATER than 1.

11. The best answer is E.

It's easy to see that  $5^2 - 20 = 5$ , and that doesn't follow the rule.

12. The best answer is D.

The value of  $Y^2 - X$  is negative, therefore cannot be under a square root. There's no need to check anything else.

13. The best answer is B.

The given phrase is equivalent to:  $-(3^B/3^A)$ . The phrase inside of the brackets is greater than 1, and therefore the phrase is smaller than  $-1$ .

14. The best answer is C.

Conclude that B is greater than A, and their both positive. The terms in A and B are always positive.  $A/B$  is smaller than 1, therefore cannot be greater than  $(B/A)^2$  which is greater than 1.

15. The best answer is D.

D is the only negative number among the answers.  $Y^{12}$  is positive,  $-(X-Y)$  is negative and  $X^5$  is positive.

16. The best answer is E.

E is the only answer that gives us the possibility of a positive value. Almost any positive number instead of X we'll give us a negative phrase under the square root.

17. The best answer is C.

$A^4/B$  is always a negative number, and so is  $A/2$ . The sum of them is a negative number too.

18. The best answer is B.

$B^2$  is a positive number between 0 and 1. A is a negative number which is smaller than  $-1$ . The sum of these two is always negative.

19. The best answer is B.

There is no specific relationship between A and B, therefore you cannot determine which of them is greater.

20. The best answer is A.

The given phrase is equivalent to  $4A^2 + 0.6 > B$ , and if  $B > 0$  we can power the phrase by 2, and get answer A.

21. The best answer is C.

The left side is always a negative number, and cannot be greater than a positive number.

22. The best answer is B.

B is the only answer that includes 3, which cannot be put instead of X (division by zero).

23. The best answer is C.

2 times 32 are 64. The total price is 32+64 cents or less, which is less than 96 cents.

24. The best answer is B.

From the three rules we know that A, B and C are negative numbers, and A must be  $-3$  or less (otherwise the multiplication will be 0).  $B/C^2$  is a negative phrase that must be smaller than  $A - B$ , which is a positive phrase.

25. The best answer is C.

If  $X$  is greater than  $Y$ , The relationship between the opposite numbers turns upside down, weather they are either both negative or positive.

26. The best answer is B.

The phrase  $2|Z-1|$  is a positive, even number, therefore the value of the whole phrase must be a positive number, larger than 1.

27. The best answer is D.

The phrase is equivalent to  $(1/X)^9$ , which is smaller than  $-1$ , and is certainly smaller than  $1/X$ .

28. The best answer is E.

No matter if  $B$  is negative or positive,  $2B$  is always smaller than  $0.5$  and therefore – smaller than  $A$ .

29. The best answer is B.

We can eliminate answers C, D and E, that include infinities. Putting the endpoints of  $A$  won't give us the right answer.

30. The best answer is A.

$C$  and  $D$  are impossible answers since  $X^2$  (positive) cannot be greater than  $1/Y$  (negative).  $E$  is an impossible since a number greater than 1 cannot be smaller than it's opposite.  $B$  cannot be true since a negative number ( $X$ ) cannot be greater than a positive one ( $Y$ ).

31. The best answer is C.

$A$  can be  $\frac{1}{2}$  and  $B$  can be 1.

32. The best answer is B.

$(1/X)^{-2}$  is equivalent to  $X^2$  which is a positive number, greater than 1.

33. The best answer is B.

17 times 1.5 is exactly 25.5, and 17 is the MAXIMUM number of containers.

34. The best answer is B.

If  $B > A$  then the phrase  $B/A$  is greater than 1.  $A$  and  $B$  must have the same sign.

35. The best answer is C.

The phrase under the square root mustn't be negative, therefore X must be greater than 20/9.

36. The best answer is E.

There is no info about the signs, the best thing we can do is put a triple root on both sides.

37. The best answer is D.

$A^2 + 2AB + B^2$  is always greater or equal to  $2AB$ .

38. The best answer is A.

The absolute value of Y and X is greater than 1, therefore a positive integer ( $Y^2$ ) is greater than a fraction ( $X^{-1}$ ).

39. The best answer is C.

Take the greatest sum of money (35) and divide it by the smaller number of people (2) – you get the maximum amount (17.5). Take the smallest sum of money (10) and divide it by the smaller number of people (10) – you get the minimum amount (1).

40. The best answer is B.

Changing the structure of the phrase gives us:  $|A| + |Y| > 4/6$ . That must always be true if A and B have different signs.

- a)  $X^2$ .
- b)  $(X+1)^2$
- c)  $(X+2)^2$
- d)  $X^3 + X$
- e)  $2X^2$

- a)  $X(X+2) + 2$
- b)  $X(X+1) + 1$
- c)  $X(X+1)$
- d)  $X^2$
- e)  $X^3 + 1$

3. X, Y, Z, and w are integers. The expression  $X-Y-Z$  is even and the Expression  $Y-Z-W$  is odd. If X is even what must be true?

- a)  $Y-Z$  must be odd.
- b) W must be even.
- c) W must be odd.
- d) Z must be even.
- e) Z must be odd.

4. X is an even number and Y is a positive odd number. Which of the following expressions cannot be even?

- a)  $(XY)^Y$
- b)  $X^3Y^3$
- c)  $X^3$
- d)  $XY$
- e)  $Y^2$

5. X is a prime number bigger than 10. Also,  $Y = X + X^3 + X^5 + X^7$ . What is definitely true about Y?

- a) Y is a prime number.
- b) Y is odd.
- c) Y is even.
- d) Y is divisible by 3.
- e) Y is divisible by 7.

6. P is divisible by 4; Q is divisible by 3.

- a)  $Q(P+1)$
- b)  $2P+3Q$
- c)  $PQ^2$
- d)  $P^2Q^3$
- e) None of the answers.

- a)  $B < A$
- b)  $A < B$
- c) A and B are even.
- d) A is even and B is either even or odd.
- e) B is even.

8. A is even and B is odd. Which of the following expressions cannot be an integer?

- a)  $\frac{A+1}{B+1}$
- b)  $\frac{A+1}{B}$
- c)  $\frac{B-1}{A^2}$
- d)  $\frac{A}{64}$
- e)  $\frac{A^4}{A \cdot B}$

9. T and S are prime numbers larger than 2. Which of the following expressions cannot an integer?

- a)  $\frac{S \cdot T}{3}$
- b)  $\frac{S+T}{2}$
- c)  $\frac{S \cdot T}{2}$
- d)  $\frac{S+T}{11}$
- e)  $\frac{S+T^2}{4}$

10. A and B are integers. The expression  $(A+1)(B+1)$  is even. What can be said about A and B?

- a) They are both even numbers.
- b) At least one of them is even.
- c) At least one of them is odd.
- d) They are both odd.
- e) Nothing can be said surly on A and B.

11. In orange county one fifth of the people are gathering mushrooms and one seventh of the people are collecting apples. What can be the number of people in Orange County?

- b) 42.
- c) 85.
- d) 140.
- e) 252.

12. In Tukitu village, one forth of the people are raising flowers, one ninth are growing wheat and one eleventh are going bankrupt. What could be the number of people in the village?

- a) 792.
- b) 540.
- c) 198.
- d) 132.
- e) 346

13. Danny can divide his herd into 5 equal parts and also to 6 equal parts, but not to 9 equal parts. How many cows can Danny have in his herd?

- a) 155.
- b) 336.
- c) 180.
- d) 120.
- e) 456

14. The number of bunnies in Peter's yard increases by 4 times every week. How many weeks will it take for the number of bunnies to be equally divided by 8 assuming that he started out with 3 bunnies?

- a) 1.
- b) 2.
- c) 3.
- d) 4.
- e) Never.

15. If  $X = 2^3 \times 5^2 \times 7$ , then the expression  $X/8$  can't be divided equally by:

- a) 1.
- b) 2.
- c) 5.
- d) 7.
- e) 25.

16. The remainder when dividing the expression  $(X + Y)$  by 5 is 4. The remainder of  $X$  divided by 10 is 2. What is the remainder of  $Y$  divided by 5?

- a) 1.
- b) 2.
- c) 3.
- d) 4.

17.  $Q$  is a prime number bigger than 10. What is the smallest positive number (except 1) that  $3Q$  can be divided by equally?

- a)  $3Q$ .
- c) 3.
- d)  $Q+3$ .
- e)  $2Q$ .

18. A is a prime number ( $A > 2$ ). If  $C = A^3$ , by how many different integers can C be equally divided?

- a) 5.
- b) 6.
- c) 3.
- d) 4.
- e) 7.

19. A can be divided by 11 with no remainder. Which of the following expressions can be divided by 11 with a remainder of 1?

- a)  $A-20$ .
- b)  $A-12$ .
- c)  $A-9$ .
- d)  $A-10$ .
- e)  $A-13$ .

20. Eggs are sold in packages of six or eleven only. If Doris bought 70 eggs exactly, what could be the number of large packages (11 eggs each) Doris bought?

- a) 6.
- b) 2.
- c) 3.
- d) 5.
- e) 4.

21. X, Y and Z are three consecutive positive numbers ( $X < Y < Z$ ). What is the value of the following expression:  $\frac{Z-Y}{Y-X} / \frac{Y-Z}{X-Y}$ ?

- a) 1.
- b) 0.
- c) -1.
- d) 2
- e)  $X-Z$



22. A, B, C are three consecutive positive numbers ( $A > B > C$ ).

- a)  $6A+7$ .
- b)  $5A+1$ .
- c)  $5A-1$ .
- d)  $6A-5$ .
- e)  $6A-7$ .

23. Q, R, S, and T are four consecutive positive numbers. Which of the following expressions must be odd?

- a)  $QR + ST$ .
- b)  $Q + R + S + T$ .
- c)  $Q^2 + S^3$ .
- d)  $Q^2 + R^2$ .
- e)  $Q^2 + 2R$ .

24. D, N and A are three consecutive positive numbers ( $A > N > D$ ). Which of the following could not be an integer?

- a)  $\frac{D + N + A}{3}$
- b)  $\frac{D - N}{D \cdot N}$
- c)  $\frac{D - A}{N - A}$
- d)  $\frac{D \cdot N \cdot A}{D - A}$
- e)  $\frac{A \cdot D}{N - A}$

25. X, Y and Z are consecutive numbers ( $X > Y > Z$ ).  $X + 2Y + 3Z = 5Y + 4$ . What is Z?

- a) 5.
- b) 6.
- c) 3.

- d) 4.
- e) 2.

26. The sum of 3 consecutive numbers is definitely:

- a) Positive.
- b) Divisible by 2.
- c) Divisible by 3.
- d) Divisible by 4.
- e) Divisible by 5.

27.  $35^2 - 34^2 = ?$

- a)  $35 - 34$ .
- b)  $35 + 34$ .
- c)  $35^2$ .
- d)  $2 \times 35 \times 34$ .
- e) 34.

28. B and A are consecutive numbers. If  $A + B + X = 15$  then what is true about X?

- b) A number that can be divided equally by 3.
- c) Positive.
- d) Even.
- e) Odd.

29. A and B are numbers between 0 and 9. When multiplying 56 by another number the result is 1AB. which of the following can represent A?

- a) 8.
- b) 2.
- c) 6.
- d) 4.
- e) 5.

30. Q and R are numbers between 0 and 9. When multiplying 71 by another double-digit number the result is 7PQ. Which of the following can represent Q?

- a) 1.
- b) 8.
- c) 3.
- d) 5.
- e) 4.

31. A and B are numbers between 1 and 9. If  $A = 4B$  then by what number is the two digit number BA not divisible?

- a) B.
- b) 2.
- c) 7.
- d) 14.
- e) 3.

32. A and B are numbers between 1 and 9. What is  $ABAB/AB$ ?  
(AB is a two-digit number and ABAB is a 4-digit number).

- a) 11
- b) BAB
- c) 101
- d) AB
- e) 100

33. V, W, X, Y and Z are numbers between 0 and 9.  
If  $XYZ / 15 = WV$  (WV is a 2 digit number, XYZ is a 3 digit number).  
Then which of the following numbers can represent XYZ?

- a) 321
- b) 215
- c) 633
- d) 570
- e) 414

34. A, B and C are different numbers, each between 0 and 9.  
If  $B = C+2$ , what is  $BCA - CBA$ ? (CBA and BCA are 3 digit numbers).

- a) 170.
- b) 180.
- c) 173.
- d) 198.
- e) 146.

35. If  $\sqrt{2} \cdot \sqrt{32} \cdot \sqrt{a} = a$ , what is a?

- a) 64.
- b) 16.
- c) 8.
- d) 4.
- e) 2.

36. If  $\frac{1}{3} < A < 2$ , which of the following expressions can have the largest value?

- a)  $A^2/3$ .
- b)  $A$ .
- c)  $A/2 + 1/3$ .
- d)  $A + 1/3$ .
- e)  $A^3 - 4$ .

37. What is the smallest possible common multiple of three integers, each larger than 26?

- a) 27.
- b) 54.
- c) 846.
- d) 19,656.
- e) 21,924.

38. What is the smallest possible common multiple of two integers, both bigger than 260?

- a) 261.
- b) 262.
- c) 524.
- d) 12,542.
- e) 18,244.

39. What is the units' digit of  $(9)^7(17)^3(3)^3$ ?

- a) 3.
- b) 5.
- c) 7.
- d) 8.
- e) 9.

What is the value of  $(d+c) - (b+a)$ ?

- a) 1.
- b) 2.
- c) 3.
- d) 4.
- e) 0.

41. If A, B and C are consecutive integers ( $A < B < C$ ) and  $6A - 4B = A$ , what is the value of C?

- a) 6.
- b) 5.
- c) 4.
- d) 3.
- e) 2.

42. If  $X$  is a positive integer and  $(405)^4$  is a multiple of  $3^X$ , what is the largest possible value of  $X$ ?

- a) 5.
- b) 12.
- c) 16.
- d) 20.
- e) 26.

43. The flying acrobatic team is made up of 120 airplanes. The team wants to form a rectangular formation with  $X$  planes in a row and  $Y$  planes in a column. If the number of airplanes in a row is no less than 4 and no more than 30, how many different combinations of rectangular shapes are possible?

- a) 4.
- b) 5.
- c) 6.
- d) 8.
- e) 10.

Explanations:

1. The best answer is B.

The easiest way is to try out a number, let's say  $X=2$ .

You can see that B is 9, and that is always an odd number.

2. The best answer is C.

You don't know whether or not  $X$  is even. In answer C you have a multiplication of two consecutive numbers so one of them must be even and an even number multiplied by an odd number is always even.

3. The best answer is C.

The first expression is even and the second is odd, the differences between the two expressions is  $x$  instead of  $w$ . (remember, there is no differences in odd/even numbers if the number is positive or negative so  $y-z$  is like  $z-y$ ). So if  $x$  is even  $w$  must be odd.

4. The best answer is E.

The fastest way to solve this problem is by plugging in some numbers.

Lets say:  $X = 2$ ,  $Y = 1$ .

According to answer e:  $1 \times 1 = 1$  and that must be an odd number.

5. The best answer is C.

Because  $X$  is a prime number bigger than 10, it must be odd. Ignoring the powers of  $X$  in the expression of  $Y$ , you'll see that  $Y$  is a sum of 4 odd numbers therefore it must be even.

6. The best answer is E.

$P$  must be even but  $Q$  is either even or odd (3,6...). None of the following answers are definitely odd although some can be.

7. The best answer is D.

$2A - B = B - A \Rightarrow 3A = 2B$ . Therefore  $3A$  must be an even number and since 3 is odd,  $A$  must be even. (The identity of  $B$  is unknown)

8. The best answer is A.

In this question we are looking for an expression: odd/even, which cannot be an integer. In answer A: The numerator is odd and the denominator is even therefore it can't be an integer.

9. The best answer is C.

In this question we are looking for an expression: odd/even, which cannot be an integer. In answer C: The numerator is odd and the denominator is even therefore it can't be an integer.

10. The best answer is C.

Because the given expression is even, at least one of the phrases in one of the parenthesis must be even therefore either  $A$  or  $B$  must be odd.

11. The best answer is D.

The answer must be a number that is divisible by seven and by 4 equally.

The only possible number is 140.

12. The best answer is A.

The answer must be a number that is divisible equally by 4, 9 and 11.

The only possible answer is A.

13. The best answer is D.

The number of cows should be divisible by 5 and 6 but not by nine, the answer is D.

14. The best answer is B.

In the beginning he has 3, after one week he has 12 and after the second week he has 48 and that can be equally divided by 8.

15. The best answer is B.

From the given expression we learn that  $X/8 = 25 \times 7$ , and so it cannot be divided equally by 2.

16. The best answer is B.

The best way is to place numbers.  $(X+Y) = 19$  and so  $19/5$  gives a remainder of 4.  $X = 12$  and  $12/10$  gives a remainder of 2. Therefore Y is 7.  $7/5 = 1$  and a remainder of 2.

17. The best answer is C.

$3Q$  is composed of a prime number (Q) larger than 10, and of 3. So, it can be divided equally by  $3Q$ , by 1 and by the components 3 and Q. The smallest number therefore is 3.

18. The best answer is D.

Factorize C:  $C = A \times A \times A$ . Therefore C can be equally divided into 1, A,  $A^2$ , and  $A^3$  = C → 4 numbers all together.

19. The best answer is D.

Let's try  $A = 22$ . In expression D:  $22-10=12$ .

$12/11 = 1$  with a remainder of 1.

20. The best answer is B.

If she bought 2 boxes (22 eggs) then she has 48 eggs left. 48 eggs are divided equally into eight boxes of 6.

21. The best answer is A.

Try the following numbers:  $X=1$ ,  $Y=2$ ,  $Z=3$  and the expression will

$$\text{Be } \frac{1}{1} / \frac{-1}{-1} = 1.$$

22. The best answer is E.

One way is to try out some numbers.

A different way is by expressing B and C according to A.

$C = A - 2$ ,  $B = A - 1$ . So the expression becomes:  $2A + (A-1) + 3(A-2) = 6A - 7$ .

23. The best answer is D.

You can ignore the powers. Q and R are consecutive numbers and therefore one of them is even and the other one is odd. The result of the sum of an even number and an odd number must be an odd number.

24. The best answer is B.

In this question we are looking for an expression: odd/even that cannot be an integer.

In answer B: The numerator is odd (1) and the denominator is even because it's a multiplication of two consecutive numbers therefore it cannot be an integer.

25. The best answer is A.

$$X + 2Y + 3Z = 5Y + 4 \Rightarrow X + 3Z = 3Y + 4$$

Lets try the first answer:  $Z = 5$ , so  $Y = 6$  and  $X = 6$ .

Lets check the equivalence:  $7 + 15 = 22 = 18 + 4$ . That's the right answer.

26. The best answer is C.

This is a rule: 3 can always divide the sum of three consecutive numbers equally. For example take  $3 + 4 + 5 = 12$ .

27. The best answer is B.

$$35^2 - 34^2 = (35 - 34)(35 + 34) = 1(35 + 34). \text{ B is the answer.}$$

28. The best answer is D.

$A + B$  is an odd number; in order for the sum to be equal to 15 X must be an even number.

29. The best answer is C.

We have two choices:  $56 \times 2 = 112$  or  $56 \times 3 = 168$ .

Therefore A could be 1 or 6. The answer is  $A = 6$ .

30. The best answer is A.

We have two choices:  $71 \times 10 = 710$  or  $71 \times 11 = 781$ .

Therefore Q can be 0 or 1. The answer is A.

31. The best answer is E.

You have two choices: 1)  $4 = 4 \times 1$  2)  $8 = 4 \times 2$ .

In the first choice,  $(BA = 14)$  can be divided by all the numbers except 3.



In the second choice,  $(BA = 28)$  can be divided by all the numbers except 3. Therefore, E is the answer.

32. The best answer is C.

The easiest way is to try two numbers:  $A = 1$ ,  $B = 2 \Rightarrow AB = 12$ ,  
 $ABAB = 1212$ .  $1212/12 = 101$ .

33. The best answer is D.

We see that XYZ should be equally dividable by 15, or by 5 and 3.  
The only number that fits those conditions is 570.

34. The best answer is B.

Lets put in some numbers.  $C = 1$ , so  $B = 1 + 2 = 3$ . There is no information about A so we'll pick an arbitrary number.  $A = 2$ .  
 $BCA - CBA = 312 - 132 = 180$ . B is the answer.

35. The best answer is A (64).

Lets raise both sides of the equation by the power 2.  
 $2 \times 32 \times a = a^2 \Rightarrow a = 64$ .

36. The best answer is E.

Try the answers for the largest and smallest values A can get.  
Take  $A = 1.9$ , answer E will be the largest and so this is the expression that can be the largest among the other expressions.

37. The best answer is A.

All of the integers have to be greater than 26, thus 27 and up. The question didn't mention that they have to be different and so they can all be equal to 27.  
The smallest common multiple of 27 is 27 itself.

38. The best answer is A.

All of the integers have to be greater than 260, thus 261 and up. The question didn't mention that they have to be different from one another and so they can all be equal to 261.  
The smallest common multiple of 261 is 261.

39. The best answer is E.

$(17)^3(3)^3 = (17 \times 3)^3 = (51)^3 = 51 \times 51 \times 51 \rightarrow$  the units' digit is just  $1 \times 1 \times 1 = 1$ .  
We are left with the units' digit of  $9^7$ .  
 $(9)^7 = 9 \times 81 \times 81 \times 81 \rightarrow$  the units' digit is 9.  
And therefore the units' digit of the entire expression is 9.

40. The best answer is D.

Plug in some numbers. Try  $a=1$ ,  $b=2$ ,  $c=3$  and  $d=4$ .

$(d+c) - (b+a) = 7 - 3 = 4$ . It will work with any number since the difference between any two consecutive integers is always 1.

41. The best answer is A.

B is the number following A, thus  $6A - 4(A+1) = A \rightarrow A = 4 \rightarrow C = 6$ .

42. The best answer is C.

Find the factors of  $(405)^4$  and see what the largest value of X can be.

$405 = 81 \times 5 = 9 \times 9 \times 5 = 3 \times 3 \times 3 \times 3 \times 5 \Rightarrow (405)^4 = (3 \times 3 \times 3 \times 3 \times 5)^4 = 3^{16} \times 5^4$ .

The largest possible value of  $3^X$  that is still a factor of  $(405)^4$  is the largest possible value of X and that is  $3^{16}$ .  $X = 16$ .

43. The best answer is D.

Use the factors of 120 are:  $1 \times 120$ ,  $2 \times 60$ ,  $3 \times 40$ ,  $10 \times 12$ ,  $4 \times 30$ ,  $5 \times 24$ ,  $6 \times 20$  and  $8 \times 15$ .

We are looking for combinations of (row x column) that are all between 8 and 30.

The possibilities are:  $8 \times 15$ ,  $15 \times 8$ ,  $4 \times 30$ ,  $30 \times 4$ ,  $5 \times 24$ ,  $24 \times 5$ ,  $6 \times 20$ ,  $20 \times 6$ ,  $10 \times 12$  and  $12 \times 10$ . That is 10 possibilities total.

X is an even number, which of the following is odd?

a)  $X^2$ .

b)  $(X+1)^2$

c)  $(X+2)^2$

d)  $X^3 + X$

e)  $2X^2$

X is an integer, which of the following must be even?

a)  $X(X+2) + 2$

b)  $X(X+1) + 1$

c)  $X(X+1)$

d)  $X^2$

e)  $X^3 + 1$

x, y, z, and w are integers. The expression  $x-y-z$  is even and the Expression  $y-z-w$  is odd. If x is even what must be true?

a)  $y-z$  must be odd.

b) w must be even.

- c) w must be odd.
- d) z must be even.
- e) Z must be odd

4. X is an even number and Y is a positive odd number. Which of the following expressions mustn't be even?

- a)  $(XY)^Y$
- b)  $X^3Y^3$
- c)  $X^3$
- d)  $XY$
- e)  $Y^2$

5. X is a prime number bigger than 10. Also,  $Y = X + X^3 + X^5 + X^7$ .  
What is definitely true about Y?

- a) Y is a prime number.
- b) Y is odd.
- c) Y is even.
- d) Y is divisible by 3.
- e) Y is divisible by 7.

6. P is divisible by 4. Q is divisible by 3. Which of the following is definitely odd?

- a)  $Q(P+1)$
- b)  $2P+3Q$
- c)  $PQ^2$
- d)  $P^2Q^3$
- e) None of the above.

7. A and B are integers. If  $2A-B = B-A$ , than which of the following is true?

- a)  $B < A$
- b)  $A < B$
- c) A and B are even.
- d) A is even and B is either even or odd.
- e) B is even.

8. A is even and B is odd. Which of the following expressions can't be an integer?

- a)  $\frac{A+1}{B+1}$
- b)  $\frac{A+1}{B}$

c)  $\frac{B-1}{A}$

d)  $\frac{A}{64}$

e)  $\frac{A^4}{A \cdot B}$

9. A and B are integers. The expression  $(A+1)(B+1)$  is even.  
What can be said about A and B?

- a) They are both even numbers.
- b) At least one of them is even.
- c) At least one of them is odd.
- d) They are both odd.
- e) Nothing can be said surly on A and B.

10. Q, R, S, and T are four consecutive positive numbers. Which of the following expressions must be odd?

$QR + ST$ .

$Q + R + S + T$ .

$Q^2 + S^3$ .

$Q^2 + R^2$ .

$Q^2 + 2R$ .

11. A is an integer. Which of the following expressions must be even?

$A(A+2) - 1$ .

$A(A - 1) + 1$ .

$(A+1)(A+2)$ .

$(A - 1)(A + 3)$ .

$A^2 - 1$ .

12. N is a prime number bigger than 5. Which of the following expressions must be even?

$(N+2)^2$ .

$N^2+2$ .

$N(N+2)$ .

$$(N+1)(N+2).$$
$$(N-2)^2.$$

13. X and Y are integers. If  $(4X + 3Y = 3Y - X)$ , which of the following is true?

- X is even.
- X is odd.
- Y is even.
- Y is odd.
- None of the above.

Explanations:

1. The best answer is B.

The easiest way is to try out a number, let's say  $X=2$ .

You can see that B is 9, and that is always an odd number.

2. The best answer is C.

You don't know whether or not X is even. In answer C you have a multiplication of two consecutive numbers so one of them must be even and an even number multiplied by an odd number is always even.

3. The best answer is C.

The first expression is even and the second is odd, the differences between the two expressions is x instead of w. (remember, there is no difference in odd/even numbers if the number is positive or negative so  $y-z$  is like  $z-y$ ). Therefore if x is even w must be odd.

4. The best answer is E.

The fastest way to solve this problem is by trying out some numbers.

Let's say:  $X = 2$ ,  $Y = 1$ .

According to answer e:  $1 \times 1 = 1$  and that must be an odd number.

5. The best answer is C.

Because X is a prime number bigger than 10, he must be odd. Ignoring the powers of X in the expression of Y, you'll see that Y is a sum of 4 odd numbers therefore it must be even.

6. The best answer is E.

P must be even but Q is either even or odd (3,6...). None of the following answers are definitely odd although some can be.

7. The best answer is D.

$2A - B = B - A \Rightarrow 3A = 2B$ . Therefore 3A must be an even number and since 3 is odd, A must be even and B can be either even or odd.

8. The best answer is A.

In this question we are looking for an expression: odd/even, which can't be an integer. In answer A: The numerator is odd and the denominator is even therefore it can't be an integer.

9. The best answer is C.

Because the given expression is even, at least one of the phrases in one of the parenthesis must be even therefore either A or B must be odd.

10. The best answer is D.

You can ignore the powers since odds and evens remain as they were under powers. Q and R are consecutive numbers and therefore one of them is even and the other one is odd. The result of the sum of an even number and an odd number must be an odd number.

11. The best answer is C.

Answer C is a multiplication of two consecutive numbers, therefore one of them must be even, and an even number multiplied by a different number is an even number.

12. The best answer is D.

Answer D is a multiplication of two consecutive numbers, therefore one of them must be even, and an even number multiplied by a different number is an even number.

13. The best answer is A.

$4X + 3Y = 3Y - X \Rightarrow 5X = 0$ . X must be 0 and therefore it is also even.

1. In the summer season there are approximately 350,000 yellow taxis in New York City, during the holiday season the number of taxis grows by 12.5%. How many people, maximum, can simultaneously use taxis in New York assuming that there is a room for 4 passengers per taxi?

- a) 1,575,000 passengers.
- b) 1,500,000 passengers.
- c) 1,750,000 passengers.
- d) 2,625,000 passengers.
- e) 2,570,000 passengers.

2. Mike earns \$14 per hour and Phil earns \$10.5 per hour. Approximately how much less, as a percentage, does Phil earn than Mike per hour?

- a) 25%
- b) 32.5%
- c) 37%
- d) 37.5%
- e) 40%

3. The original price of a car was \$25,200. Because the car owner thought he could get more money for the car, he increased the price of the car to 110% of its original price. After a week, the car had not sold, so the owner then discounted the price by 10%, and the car was finally sold. What price was the car sold for?

- a) \$25,200
- b) \$25,000
- c) \$24,948
- d) \$24,542
- e) \$23,658

4. A frustrated greengrocer is trying to sell cucumbers at a price of \$1.5 per Kg. Unfortunately he has no success. The greengrocer gives a discount of 18% on the original price but then the cucumbers are sold too fast so he raises the price again by 10%. At that final price, how many cucumbers can you buy for \$5 assuming that there are 12 cucumbers per Kg and that only a whole number of kgs are sold?

- a) 25
- b) 34
- c) 40
- d) 46
- e) 48

5. An air-conditioning unit costs \$470. On December there was a discount for Christmas of 16%. Six months later, the holiday season was over so the company raised the price of the air-conditioning by 16%. How much will an air-conditioning unit cost in November?

- a) \$458
- b) \$470
- c) \$472
- d) \$484
- e) \$491

6. Loren bought a roll of cloth and sold it for a 5% profit. If Loren's profit was \$45.5 total on the cloth, how much did it cost her to buy the cloth?

- a) \$455.
- b) \$525.5.
- c) \$675.
- d) \$810.5.
- e) \$864.5.

7. An electrical appliances store sold this month 400% more than the average of all the other months in the year. The sales total for this month was approximately what percent of total sales for this year?

- a) 14%.
- b) 21%.
- c) 31%.
- d) 37%.
- e) 43%.

8. In a recent tender,  $X$  people participated. 35% of the  $X$  people, who made an offer won the specific tender they participated in. 70% of the rest, were disappointed from the result of the tender. Which of the following expressions represents the number of people who weren't disappointed although they didn't win the tender?

- a)  $39X/200$ .
- b)  $25X/50$ .
- c)  $19.5X/200$ .
- d)  $35X/250$ .
- e)  $90X/200$ .



9. Following an increase in prices, the price of a candy box was 10 pounds and the price of a can of soda was 6 pounds. If the price of a candy box was raised by 25%, and the price of a can of soda was raised by 50%. What was the price of a box of candy plus a can of soda before prices were raised?

- a) 11.
- b) 12.
- c) 13.
- d) 14.
- e) 14.5.

10. In a chocolate store, all chocolates are either vanilla or cocoa flavored only. 10% of the chocolates are cocoa flavored, 90% of the rest are squashed. What percentage of the chocolates are both vanilla flavored and not squashed?

- a) 1%
- b) 5%
- c) 9%
- d) 10%
- e) 2%

11. Z is 120% of Y. X is smaller than Z by 80%. What percentage is X of Y?

- a) 96%
- b) 24%
- c) 50%
- d) 40%
- e) 45%

12. A baker sold all of his donuts for a total amount of 216 pounds. If on each donut the baker made a profit of 8% of the cost, how much did it cost the baker to make all the donuts?

- a) 210.
- b) 200.
- c) 190.
- d) 180.
- e) 170.

13. In the Hillside summer camp there are 50 children. 90% of the children are boys and the rest are girls. The camp administrator decided to make the number of girls only 5% of the total number of children in the camp. How many more boys must she bring to make that happen?

- a) 50.
- b) 45.
- c) 30.
- d) 40.
- e) 25.

14. Kelly used to get a 30% discount on movie tickets. When the price of a movie ticket increased by 50%, she still got the same dollar amount of discount. What is the percent of discount Kelly got of the new Ticket price?

- a) 10%
- b) 20%
- c) 25%
- d) 35%
- e) 38%

15. If X percent of  $2.5X$  are  $3X$ , then X could be?

- a) 90.
- b) 120.
- c) 150.
- d) 170.
- e) 180.

16. In an engineering company there are 3 engineers and an expert who earn 725,000 pounds together annually. The senior engineer earns 60% of the total income. If the rest of the money is divided in a way that the two remaining engineers earn together three times more than the expert, how much money (in thousands) does the expert earn in a year?

- a) 45.
- b) 55.
- c) 60.
- d) 75.
- e) 90.

17. A Hawk can glide for 4 consecutive hours without resting using thermals only. An eagle can glide 14.5% longer without resting using the same thermals. If an eagle makes 3 stops during a certain glide, each stop after gliding its maximum possible time, how many hours long was the glide not including the resting time?

- a) 18.32.
- b) 13.74.
- c) 15.66.
- d) 9.16.
- e) 16.

18. What is  $0.05 * 0.05$  in terms of percents?

- a) 25%
- b) 2.5%
- c) 0.25%
- d) 0.025%
- e) 0.025%

19. What is  $0.04 \times 0.03 \times 0.2$  in terms of percent?

- a) 24%
- b) 2.4%
- c) 0.24%
- d) 0.024%
- e) 0.0024%

20. What is  $0.01 \times 5 \times 0.03$  in terms of percent?

- a) 15%
- b) 1.5%
- c) 0.15%
- d) 0.015%
- e) 0.0015%

21. A pizza house sells 30 pizzas on a Friday night. On a weekday it sells 11% less. How many pizzas will the pizza house sell in a 28 days month assuming that Saturday is a “no business” day?

- a) 320.
- b) 654.
- c) 235.
- d) 600.
- e) 540.

22. Travis is earning \$3,500 quarterly. If Travis pays 2.5% of that amount quarterly to support groups and he paid \$525 so far, for how many years now has Travis been paying?

- a) 2.
- b) 1.5.
- c) 4.
- d) 5.5.
- e) 6.

23. Dana borrows 5500 pounds annually for her college education. If Dana gives her parents 3% of that amount back each month, how much will she still owe her parents after four years of college?

- a) 12,430.
- b) 13,640.
- c) 14,000.
- d) 14,080.
- e) 15,020.

24. Mr. Rusty owes the bank \$1,080,000, he returns \$40,000 quarterly to the bank. If the tax on the money Rusty owes is compounded quarterly by 0.25%, how many months will it take Rusty to owe the bank no more than 1 million dollars?

- a) 3.
- b) 6.
- c) 9.
- d) 12.
- e) 15.

25. Simba borrowed \$12,000. If Simba returns 4.5% of that amount every 2 weeks, after how many months will Simba finish his debt?

- a) 8.
- b) 12.
- c) 15.
- d) 18.
- e) 20.

26. The average price of an antique car increases over the years. If from 1990 to 1996, the price of the car increased by 13% and from 1996 to 2001 it increased by 20%, what is the price of the car in 2001 if the price in 1990 was \$11,500?

- a) \$15,594.
- b) \$15,322.
- c) \$14,786.
- d) \$14,543.
- e) \$12,988.

27. An apartment on King-Williams street was valued in 1983 and again in 1993. From 1973 to 1983 it's value decreased by 16% and from 1983 to 1993 it's value increased by 16%. What is the value of the apartment in 1993 if in 1973 it was worth \$40,000?

- a) \$38,796.
- b) \$40,000.
- c) \$38,976.
- d) \$39,679.
- e) \$36,796.

28. The value of a stock decreased by 15% in the last two years. Economists believe that the value of the stock will rise 7% during the following year, If that happens, the value of the stock will be \$440. What was the approximate price of the stock two years ago?

- a) \$473.
- b) \$464.
- c) \$455.
- d) \$445.
- e) \$430.

Explanations:

1. The best answer is A.

12.5% of 350,000 are 43,750 taxis thus  $350,000 + 43,750 = 393,750$  taxis.

$393,750 \times 4 = 1,575,000$  passengers in the holiday season.

2. The best answer is A.

Mike earns  $(14 - 10.5)$  \$3.5 more than Phil, that is  $3.5/14 = 0.25 = 25\%$ .

3. The best answer is C.

When you raise a number by X% and then you reduce X% you don't get the original number again because the second time you took X% off you reduced it from a larger number thus answer A is not the correct one, let's check:  $25,200 \times 1.1 = 27,720$ .

$27,720 \times 0.9 = 24,948$ .

4. The best answer is E.

$1.5 \times 0.82 = \$1.23$ .

$\$1.23 \times 1.1 = 1.353\$$

$5 / 1.353 = 4$  Kg and change = 48 cucumbers.

5. The best answer is A.

Pay attention, when you raise a number by X% and then you reduce X% you don't get the original number again because the second time you took X% off you reduced it from a larger number thus answer A is not the correct one, let's check:

$470 \times 0.84 = 394.8$ .

$394.8 \times 1.16 = \text{approximately } \$458$ .

A simpler way to solve this problem is by knowing that the price would be lower than the original price because we increased and decreased the same amount of percentage.

6. The best answer is E.

5% of the total price of the cloths is 45.5 dollars, multiply this number to get the entire 100% of the total selling price:  $(45.5 \times 20 = \$910)$ . Now subtract the profit \$45.5 to get the cost:  $910 - 45.5 = \$864.5$ .

7. The best answer is C.

Plug in 1\$ as the sales for each of the other 11 months.

On that special month, the store sold 400% more (400% of 1 is 4), or \$5. The sales of this month relative to the sales of the entire year are  $5/(11 + 5)$ .  $5/16$ , which is a bit less than  $1/3$  (33%).

8. The best answer is A.

65X/100 is the number of people who didn't win the tender. 30% of that number is the number of people who weren't deeply disappointed about the fact that they didn't win.

$$30 \times (65X/100) / 100 = 19.5/100 = 39/200.$$

9. The best answer is B.

For the candy box, 10 pounds is 125%; therefore the original price was 8 pounds.

The same thing goes with the soda, 6 pounds is 150%, and therefore the original price was 4.

The price of both products together was 12p before the rise.

10. The best answer is C.

Pick a number of chocolates; it is best to take 100 as an example.

10 are cocoa, 90% of the rest ( $0.9 \times 90 = 81$ ) are squashed.

That means that only 9 are both vanilla flavored and not squashed.

11. The best answer is B.

Pick numbers:  $Y=100 \rightarrow Z=120 \rightarrow X = 0.2 \times 120 = 24$ .

$$X/Y = 24\%$$

12. The best answer is B.

If on each donut he made a profit of 8% than he made the same profit on all of his donuts.

That means that 216 pounds are 108% of the cost, and 100% is 200 pounds.

13. The best answer is A.

The total number of girls in the camp is ( $0.1 \times 50 = 5$ ). In order for 5 girls to be 5% there has to be a total number of 100 kids in the camp therefore the camp's administrator should bring 50 more boys.

14. The best answer is B.

The price of the ticket is unknown. Take 100 as an example.

30% discount of 100 is \$30, that amount remained the same after the price of a ticket grew by 50%.

The new price of a ticket is \$150, so  $30/150$  is 20%.

15. The best answer is B.

X percent is  $X/100$ .

X percent of  $2.5X$  is  $(X/100)(2.5X) = (X/100)(5X/2) = 3X$  ÷ divide both sides by X.

$$(X/40) = 3 \rightarrow X = 120.$$

16. The best answer is D.

The senior engineer earns (60% of \$725,000 = \$435,000).

The rest of the money ( $725,000 - 435,000 = \$290,000$ ) is divided in a 3:1 ratio in favor of the engineers.

And therefore the expert earns ( $1/4 \times \$290,000 = \$72,500$ ).

17. The best answer is A.

14.5% of 4 are 0.58. Thus, an eagle can fly for 4.58 consecutive hours without resting. Since the eagle rested 3 times, he could glide four periods  $4 \times 4.58$  hours = 18.32 hours.

18. The best answer is C.

Since 0.05 and 0.05 each have 2 decimal places, their product must have 4 ( $2 + 2$ ) decimal places. Because  $5 \times 5$  is 25, you need to add 2 zeros to get the correct number of decimal places, so the product of 0.05 and 0.05 is 0.0025. To change a decimal to a percentage you multiply by 100 by moving the decimal point 2 places to the right, so 0.0025 is 0.25%.

19. The best answer is D.

The number we're supposed to see in the answers is  $4 \times 3 \times 2 = 24$ . It fits all answers. The real question is the decimal of the answer; the basic rule is to add the decimals ( $2+2+1=5$ ).

We want the answer in percent terms so we need to take two decimals down, overall-3.

The answer is  $24/1000$  (3 decimals) = 0.024%

20. The best answer is C.

Since 0.01 and 0.03 each have 2 decimal places, their product must have 4 ( $2 + 2$ ) decimal places. Because  $1 \times 3 \times 5$  is 15, you need to add 2 zeros to get the correct number of decimal places, so the product of 0.01, 5 and 0.03 is 0.0015. To change a decimal to a percentage you multiply by 100 and move the decimal point 2 places to the right, so 0.0015 is 0.15%.

21. The best answer is B.

On a weekday the pizza house sells 89% of 30 = 26.7 pizzas.

In a month there are 4 Fridays --->  $4 \times 30 = 120$  pizzas.

There are 4 x 5 weekdays (there is no Saturday) --->  $20 \times 26.7 = 534$ . All together 654 pizzas.

22. The best answer is B.

Travis pays 2.5% of 3500, which is \$87.5 every 3 months (quarterly).

( $525/87.5 = 6$ ), therefore Travis has been paying for ( $6 \times 3 = 18$ ) months now, that is a year and a half.

23. The best answer is D.



Dana takes 5500 each year and returns ( $0.03 \times 5500 = 165$ ) each month, which is ( $165 \times 12 = 1980$ ) each passing year. That means that each year Dana owes her parents ( $5500 - 1980 = 3520$ ) pounds.

After 4 years in college she will owe them ( $4 \times 3520 = 14,080$ ) pounds.

24. The best answer is C.

Every three months Rusty gives the bank \$40,000.

In order to reduce his debt to less than 1 million dollars, rusty has to pay three installments, since every quarter he pays \$40,000 and an interest of 0.25% is added to his debt. After two payments he will have paid \$80,000, but still owed more than 1 million, only after the third payment will he owe less.

25. The best answer is B.

Simba gives ( $0.045 \times 12,000 = 540$ ) to his brothers every 2 weeks, in a month he gives ( $540 \times 2 = 1080$ ). ( $12,000/1,080$  is a little over 11), so, it will take 12 months for him to pay his debt.

26. The best answer is A.

The price in 1990 was 11,500. In 1996 the price is ( $11,500 \times 1.13 = 12,995$ ).

The price we are looking for, in 2002, is ( $12,995 \times 1.2 = \$15,594$ ).

27. The best answer is C.

In the first 10 years, the value decreased by 16% ( $40,000 \times 0.84 = 33,600$ ).

Then, in the next ten years the value increased by 16% ( $33,600 \times 1.16 = 38,976$ ).

Therefore the answer is C.

28. The best answer is A.

Start from the top, after a 7% increase the price of the stock is \$440.

440 are 107% of the price this year  $\Rightarrow$  ( $440/107 \times 100 = 411.215$ ).

Two years ago the price was 15% higher, therefore ( $411.215 \times 1.15$ ) is approximately \$473.

1. Two cars are traveling on the same road towards each other. If car A is traveling at a speed of 120 Km/h and car B is traveling 15% slower, how much time will it take the cars to meet if the initial distance between the two is 668.4 Km and car A started to drive one hour and a half before car B started?

- (a) One hours and 30 minutes.
- (b) Two hours.
- (c) Two hours and 12 minutes.
- (d) Three hours and 15 minutes.
- (e) Three hours and 18 minutes.

2. Water has been poured into an empty rectangular tank at the rate of 8 cubic feet per minute for 2.5 minutes. The length of the tank is 3 feet and the width is one half of the length. Approximately how deep is the water in the tank?

- (a) 3.23 feet
- (b) 3.86 feet
- (c) 4 feet
- (d) 4.25 feet
- (e) 4.44 feet

3. What is the sum of 11 consecutive integers?

- (1) The median of the 11 integers is 6.
- (2) The average of the 11 integers is 6.

(a) Statement (1) BY ITSELF is sufficient to answer the question, but statement (2) by itself is not.

(b) Statement (2) BY ITSELF is sufficient to answer the question, but statement (1) by itself is not.

(c) Statements (1) and (2) TAKEN TOGETHER are sufficient to answer the question, even though NEITHER statement BY ITSELF is sufficient.

(d) Either statement BY ITSELF is sufficient to answer the question.

(e) Statements (1) and (2) TAKEN TOGETHER are NOT sufficient to answer the question, requiring more data pertaining to the problem.

4. X, Y and Z are three positive integers. If  $Z = 2$ , what is their sum?

$$X - Y = 5.$$

$$3Y + 15 = 3X.$$

- (a) Statement (1) BY ITSELF is sufficient to answer the question, but statement (2) by itself is not.
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5. Roy is now 4 years older than Erik and half of that amount older than Iris. If in 2 years, Roy will be twice as old as Erik, then in 2 years what would be Roy's age multiplied by Iris's age?

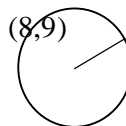
- (a) 8
- (b) 28
- (c) 48
- (d) 50
- (e) 52

6. An investment yields an interest payment of \$228 each month. If the simple annual interest rate is 9%, what is the amount of the investment?

- (a) \$28,300
- (b) \$30,400
- (c) \$31,300
- (d) \$32,500
- (e) \$35,100

7. In a rectangular coordinate system, what approximately is the area of a circle whose center is at (5, 5) and a point on its circumference is at (8, 9)?

- (a) 60
- (b) 63
- (c) 68



- (d) 79  
(e) 82
- (5,5)

8.  $x$ ,  $y$ ,  $z$ , and  $w$  are integers. The expression  $x-y-z$  is even and the Expression  $y-z-w$  is odd. If  $x$  is even what must be true?

- $y-z$  must be odd.  
 $w$  must be even.  
 $w$  must be odd.  
 $z$  must be even.  
 $Z$  must be odd

9.  $X$  is a prime number bigger than 10. Also,  $Y = X + X^3 + X^5 + X^7$ .  
What is definitely true about  $Y$ ?

- $Y$  is a prime number.  
 $Y$  is odd.  
 $Y$  is even.  
 $Y$  can be divided equally by 3.  
 $Y$  can be divided equally by 7.  
10. Is  $Y$  even?

$2Y$  is even.

$Y^2$  is even.

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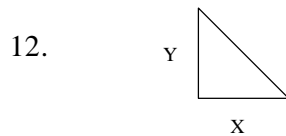
(e) Statements (1) and (2) TAKEN TOGETHER are NOT sufficient to answer the question, requiring more data pertaining to the problem.

11. If  $A$  is a prime number, what is the value of  $A$ ?

$0 < A < 10$ .

$(A - 2)$  is divisible by 3.

- (a) Statement (1) BY ITSELF is sufficient to answer the question, but statement (2) by itself is not.
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X and Y are two sides of a triangle, is the area of the triangle an integer?

X is a prime number.

Y is an odd integer.

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13. In Tukitu village, one forth of the people are raising flowers, one ninth are growing wheat and one eleventh are going bankrupt.  
What could be the number of people in the village?

- 792.
- 540.
- 198.
- 132.
- 346

14. Q is a prime number bigger than 10. What is the smallest positive number (except 1) that 3Q can be divided by equally?

- 3Q.
- Q
- 3
- Q+3
- 2Q

15.  $35^2 - 34^2 = ?$

- $35 - 34.$
- $35 + 34.$
- $35^2.$
- $2 \times 35 \times 34.$
- 34.

16. In a box there are A green balls,  $3A + 6$  red balls and 2 yellow ones.  
If there are no other colors, what is the probability of taking out a green or a yellow ball?

- $1/5.$
- $1/2.$
- $1/3.$
- $1/4.$
- $2/3.$

17. A long rope was divided to three different parts. What is the length of the smallest piece?

The sum of the two smaller pieces is 14 inch.

The sum of the two larger pieces is 22 inch.

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- (e) Statements (1) and (2) TAKEN TOGETHER are NOT sufficient to answer the question, requiring more data pertaining to the problem.

18. Fuel tanker A can fill the underground reservoir in 12 minutes. How long will it take fuel tanker A and fuel tanker B to fill up the same reservoir together?

The reservoir contains 3000 liters of fuel.

Fuel tanker B alone will require the same number of hours to fill the same reservoir.

- (a) Statement (1) BY ITSELF is sufficient to answer the question, but statement (2) by itself is not.
- (b) Statement (2) BY ITSELF is sufficient to answer the question, but statement (1) by itself is not.
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- (e) Statements (1) and (2) TAKEN TOGETHER are NOT sufficient to answer the question, requiring more data pertaining to the problem.

19. What is the ratio between A and B?

A is the sum of X, Y and Z.

B is the average (arithmetic mean) of X, Y and Z.

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- (e) Statements (1) and (2) TAKEN TOGETHER are NOT sufficient to answer the question, requiring more data pertaining to the problem.

20. Kelly used to get a 30% discount on movie tickets. When the price of the movie ticket increased by 50%, the amount of discount in dollars remained the same. What is Kelly's discount with the new Ticket price in percent terms?

- (a) 10%
- (b) 20%
- (c) 25%
- (d) 35%
- (e) 38%

21. Tom divided his cards between Tim and Din so each one received an equal odd amount of cards. The number of cards that Tim received multiplied by the number of cards that Din received is a number larger than 49 and smaller than 121. How many cards did Tom have in the first place?

- 16.
- 22.
- 18.
- 14.
- 32.

22. In the beginning of the season, the owner of a football team bought T players for the price of 4R each. At the end of the season the owner sold the players in a total profit of X. How much did the owner get for all the players?

$X - 4TR$ .



$$\begin{aligned} &4X + 4TR. \\ &4TR + X. \\ &4(TR - X). \\ &4TR - X. \end{aligned}$$

23. A bird is flying from an oak tree to a pine tree in a speed of 6 Km/h. On her way back, she flew at a speed of 4 Km/h, thus, the trip lasted 4 hours more. What is the distance between the trees? (In Km)

- 12.
- 24.
- 36.
- 48.
- 52.

24. If X and Y are both integers different from zero, what is the value of  $(X + 2Y)$ ?

$$X^4 = Y^4.$$

$$X = 5.$$

- (a) Statement (1) BY ITSELF is sufficient to answer the question, but statement (2) by itself is not.
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- (e) Statements (1) and (2) TAKEN TOGETHER are NOT sufficient to answer the question, requiring more data pertaining to the problem.

25. Is the square root of A an integer?

The last digit of A is 8.

A is divisible by 6.

- (a) Statement (1) BY ITSELF is sufficient to answer the question, but statement (2) by itself is not.
- (b) Statement (2) BY ITSELF is sufficient to answer the question, but statement (1) by itself is not.
- (c) Statements (1) and (2) TAKEN TOGETHER are sufficient to answer the question, even though NEITHER statement BY ITSELF is sufficient.
- (d) Either statement BY ITSELF is sufficient to answer the question.
- (e) Statements (1) and (2) TAKEN TOGETHER are NOT sufficient to answer the question, requiring more data pertaining to the problem.

26. Is the average of X consecutive numbers odd?

The first number in the series is odd.

The sum of the numbers is odd.

- (a) Statement (1) BY ITSELF is sufficient to answer the question, but statement (2) by itself is not.
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- (e) Statements (1) and (2) TAKEN TOGETHER are NOT sufficient to answer the question, requiring more data pertaining to the problem.

27. In a chocolate store, there are vanilla and chocolate flavor bon-bons only. 10% of the bon-bons are chocolate flavored, 90% of the rest are squashed. What percentage of the bon-bons is vanilla flavored that are not squashed?

- (a) 1%

- (b) 5%
- (c) 9%
- (d) 10%
- (e) 2%

28. A credit card number has 6 digits (between 0 to 9). The first two digits are 12 in that order, the third digit is bigger than 6, the fourth one can be equally divided by 3 and the fifth digit is 3 times bigger than the sixth one. How many credit cards can be made?

- (a) 27.
- (b) 36.
- (c) 72.
- (d) 112.
- (e) 422.

29. Out of a box that contains 4 black mice and 6 white ones, three are picked up. What is the probability that all three will be black mice?

- (a)  $8/125$ .
- (b)  $1/30$ .
- (c)  $2/5$ .
- (d)  $1/720$ .
- (e)  $3/10$ .

30. A car is driving at 60 Km/h for 20 minutes, and then drives at 90Km/h for another 40 minutes. What is the average speed of the car?

- (a) 80.
- (b) 75.
- (c) 70.
- (d) 65.
- (e) 54.

31. Two grandfathers can knit a sweater in 6 days. Two grandfathers and one grandmother can knit a sweater in 3 days. How many days will it take the grandmother to knit a sweater all by her self?

- (a) 4.5.
- (b) 5.
- (c) 5.5.
- (d) 6.
- (e) 6.5.

32. If X and Y are integers, what is the value of XY?

$$X^3 - 3X^2 - 2X - 8 = 0.$$

$$4 + 3Y = 2Y + 8.$$

- (a) Statement (1) BY ITSELF is sufficient to answer the question, but statement (2) by itself is not.
  - (b) Statement (2) BY ITSELF is sufficient to answer the question, but statement (1) by itself is not.
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  - (d) Either statement BY ITSELF is sufficient to answer the question.
  - (e) Statements (1) and (2) TAKEN TOGETHER are NOT sufficient to answer the question, requiring more data pertaining to the problem.
33. If Q and T are integers, what is the value of Q?

$$Q = 2T/7.$$

$$\frac{T+7}{2} = \frac{7(Q+2)}{4}$$

- (a) Statement (1) BY ITSELF is sufficient to answer the question, but statement (2) by itself is not.
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34. Each of the 850 local villagers in Lucia owns either a Golden Retriever or a Bernard. How many people own both?

The number of villagers who own a Golden Retriever only is 300.

The number of villagers who own a Bernard only is 280.

- (a) Statement (1) BY ITSELF is sufficient to answer the question, but statement (2) by itself is not.
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- (e) Statements (1) and (2) TAKEN TOGETHER are NOT sufficient to answer the question, requiring more data pertaining to the problem.

35. How much is Y percent of X?

- (1) 400% of Y is 90.
  - (2) X percent of Y is 25.
- 
- (a) Statement (1) BY ITSELF is sufficient to answer the question, but statement (2) by itself is not.
  - (b) Statement (2) BY ITSELF is sufficient to answer the question, but statement (1) by itself is not.
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36. In a psychology school the grade of the students is determined by the following method: At the end of the first year the grade equals to twice the age of the student. From then on, the grade is determined by twice the age of the student plus half of his grade from the previous year. If Joey's grade at the end of the first year is 40, what will be his grade at the end of the third year?

- (a) 75.
- (b) 62.
- (c) 80.
- (d) 44.
- (e) 56.

37. In a triangle, one side is 6 Cm and another side is 9 Cm. which of the following can be the perimeter of the triangle?

- (a) 18.
- (b) 25.
- (c) 30.
- (d) 32.
- (e) 34.

Explanations:

1. The best answer is C.

Car B is traveling at a speed of  $0.85 \times 120 = 102$  Km/h.

Car A travels alone a distance of  $120 \times 1.5 = 180$  Km. The remaining distance should be divided among the sum of the cars speeds:  $(668.4 - 180 = 488.4 \text{ Km}) / (102 + 120) = 2.2 = \text{Two hours and 12 minutes.}$

2. The best answer is E.

First calculate the volume of water that has been poured into the tank. If it has been poured at a rate of 8 cubic feet per minute for 2.5 minutes,  $8 \times 2.5 = 20$  cubic feet. The tank is rectangular, so its volume is length  $\times$  width  $\times$  height (or depth), with the answer in cubic units. We are given the length, and can calculate the width, since we are told that the width is  $1/2$  the length, or  $1/2$  of 3 feet, or 1.5 feet. The volume we have already calculated to be 20 cubic feet. Therefore,  $20 = \text{length} \times \text{width} \times \text{height}$ , or  $20 = 3 \text{ feet} \times 1.5 \text{ feet} \times \text{the height}$ . Solving for the height, we get  $40/9$ , or approximately 4.44 feet.

3. The best answer is D.

Statement (1) provides us with the numbers themselves- 5 on each side of 6.

From Statement (2) we know that average = sum / amount  $\Rightarrow$  sum = 66.

Therefore either statement is sufficient to answer the question.

4. The best answer is E.

We need to find the value of  $X + Y$  since  $Z$  is already given to us.

Statement (1) is insufficient since we need the sum of  $X$  and  $Y$ .

Statement (2) can be written as:  $3X - 3Y = 15 \Rightarrow X - Y = 5$ , you can see that both statements are the same and therefore more sufficient data is required.

5. The best answer is C.

Translate piece by piece into numbers.  $R$  (Roy) = Erik (E) + 4.

The second equation:  $R = I$  (Iris) + 2.

The third equation:  $R + 7 = 2(E + 7)$ . We have three equations with three variables.

⇒ Roy is 6, Iris is 4 and Erik is 2. In four years Erik would be 6 and Iris 8, the answer is 48.

6. The best answer is B.

Principal  $\times$  percent interest  $\times$  time = interest earned

Principle  $\times (0.09) \times 1/12 = \$228$ .

Solve to find the principal  $(228 \times 12)/0.09 = \$30,400$ .

7. The best answer is D.

First draw the  $x$  and  $y$  axes, then plot the points and connect them. The distance between the two points is the radius. Use Pythagoras rule to find  $R$ .

$$R^2 = 3^2 + 4^2 \Rightarrow R = 5$$

Area of a circle is:  $\pi \cdot 5^2 \approx 79$ .

8. The best answer is C.

The first expression is even and the second is odd, the only difference between the expressions is that the first expression has  $X$  and the second has  $W$ . So, if  $X$  is even  $W$  must be odd.

9. The best answer is C.

Because  $X$  is a prime number bigger than 10, he must be odd. Ignoring the powers of  $X$  in the expression of  $Y$ , you'll see that  $Y$  is a sum of 4 odd numbers therefore it must be even.

10. The best answer is C.

Statement (1) by itself is insufficient because every number that is multiplied by 2 will result in an even number. Statement (2) is also insufficient by itself since numbers like  $\sqrt{6}$  fulfills this statement although it's not even. Combine the statements and  $Y$  must be an even number.

11. The best answer is E.

Statement (1) narrows down A to be one of : 2, 3, 5 and 7. This statement is insufficient.

Statement (2) is also insufficient, there are a lot of numbers that fulfill this statement, like 17, 23 and many more. Even after you combine both statements, there are still two options: 5 and 2.

Both, when you subtract 2 you get a number that is divisible by 3.

12. The best answer is E.

The area of the triangle is  $XY/2$ .

Statement (1) tells us that X is a prime number, that can be even (2) or odd (3, 5, 7, etc.).

Statement (2) tells us that Y is an odd integer.

The multiplication of X and Y can be an odd number or an even number, thus we cannot determine if the area of the triangle is an integer or not.

13. The best answer is A.

The answer must be a number that is divisible equally by 4, 9 and 11.

The only possible answer is A.

14. The best answer is C.

3Q is a prime number so it can be divide equally by 3Q, by 1 and by the components 3 and Q. The smallest number therefore is 3.

15. The best answer is B.

$35^2 - 34^2 = (35 - 34)(35 + 34) = 1(35 + 34)$ . B is the answer.

16. The best answer is D.

The number of green and yellow balls in the box is  $A+2$ .

The total number of balls is  $4A + 8$ .

The probability of taking out a green or a yellow ball is:  $\frac{A + 2}{4A + 8} = \frac{1}{4}$ .

17. The best answer is E.

Translate the statements into variables: Let X, Y and Z be the thee pieces of the rope,  $X < Y < Z$ .

Statement (1) can be written as:  $X + Y = 14$ .

Statement (2) can be written as:  $Y + Z = 22$ .



In order to find the length of the smallest piece, we need another equation or data.  
More data is required.

18. The best answer is B.

Statement (1) is insufficient since the size of the reservoir is irrelevant.

Statement (2) is sufficient since it tells us that the second tanker has the same work rate as the first. So, it will take them both half the time it took the first tanker alone.

19. The best answer is C.

Statement (1) tells us that  $A = X + Y + Z$ .

Statement (2) tells us that  $B = (X + Y + Z)/3$ .

Using both statements together:  $A/B$  is 3.

Both statements together are sufficient.

20. The best answer is B.

The price of the ticket is unknown. It would be most convenient to plug in 100 as the price of the ticket.

A 30% discount of 100 is \$30, that amount remained the same after the price of a ticket increased by 50%.

The new price of a ticket is \$150, so  $30/150$  is 20%.

21. The best answer is C.

Answers A and E are disqualified immediately because those are even numbers that cannot be divided into two equal odd numbers. 22 is  $11 + 11$  but

$11 \times 11$  is bigger than 121, the same idea with 14, therefore the answer is 18.  $18 = 9 + 9$ .  $9 \times 9 = 81$ .

22. The best answer is C.

The owner bought T player that cost him altogether 4TR.

He had a profit of X so he sold them for  $4TR + X$ .

23. The best answer is D.

The distance to the pine tree is  $6 \times X$ , where X represents the time of the trip. The distance back to the oak tree is  $4(X+4)$ , assuming the trip back is equal in length.

Therefore  $6X = 4(X+4)$   $\Rightarrow X = 8$ . The length of the trip is  $8 \times 6 = 48$  Km.

24. The best answer is E.

Statement (1) tells us that X and Y are equal? No, they could have different signs.

Statement (2) gives us X, which is not sufficient.

Both statements together are also insufficient since Y can be -5 or 5.

More sufficient data is required.

25. The best answer is A.

If you square each digit {0, 1, 2,..., 8, 9}, you will see that the possible last digits for a square are 0, 1, 4, 5, 6 and 9. Thus, if the last digit of A is 8, A cannot be a square and the square root of A is not an integer. Statement (1) by itself is sufficient.

Statement (2) by itself is insufficient since there are numbers that are divisible by 6 and have an integer square root and numbers divisible by 6 that do not have an integer square root.

26. The best answer is B.

Statement (1) is insufficient by itself, take X as 2: if the first number is odd, the sum of the two numbers is odd. Take X as 3: if the first number is odd, the sum of the three numbers is even.

Statement (2) tells us that the sum of the numbers is odd and therefore the median must be odd.

If the median is odd the average of these numbers is also odd because that means that there is an even amount of even numbers and an odd amount of odd numbers.

This statement is sufficient by itself.

27. The best answer is C.

Pick a number of bon-bons, like 100 for example.

10 are chocolate, 90% of the rest ( $0.9 \times 90 = 81$ ) are squashed.

That means that only 9 are vanilla and are not squashed.

28. The best answer is B.

First digit is 1, the second is 2, the third can be (7,8,9), the forth can be (0,3,6,9), the fifth and the sixth are dependent with one another. The fifth one is 3 times bigger than the sixth one, therefore there are only 3 options there: (1,3), (2,6), (3,9).

All together there are:  $1 \times 1 \times 3 \times 4 \times 3 = 36$  options.

29. The best answer is B.

The probability for the first one to be black is:  $4/(4+6) = 2/5$ .

The probability for the second one to be black is:  $3/(3+6) = 1/3$ .

The probability for the third one to be black is:  $2/(2+6) = 1/4$ .

The probability for all three events is  $(2/5) \times (1/3) \times (1/4) = 1/30$ .

30. The best answer is A.

The average speed is equal to:  $(\text{Total distance})/(\text{Total time}) = (60 \times 1/3 + 90 \times 2/3)/1 = 80 \text{ Km/h}$ .

31. The best answer is D.

Two grandfathers and a grandmother can nit a sweater in 3 days, therefore they can nit 2 sweaters in 6 days. Because two grandfathers can nit 1 in 6 days then the other sweater is done by the grandmother, she can nit 1 sweater in 6 days.

32. The best answer is C.

Statement (1) can be written as  $(X - 4)(X^2 + X + 2) = 0$ .

The roots of this equation are one integer and two complex numbers, which you should pay no attention to since you were told that X is an integer.

Statement (2) is a simple equation,  $Y = 4$ .

The value of the expression XY is 16.

Both statements, taken together, are sufficient to answer the question.

33. The best answer is E.

We want to find the number value of Q.

In statement (1) we are given the ratio between Q and T, which is not sufficient.

Statement (2) can be simplified:

$$\frac{T+7}{2} = \frac{7(Q+2)}{4} \Rightarrow T+7 = \frac{7Q+14}{2} \Rightarrow T+7 = \frac{7Q}{2} + 7 \Rightarrow T = \frac{7Q}{2}.$$

We can see that the same ratio is given in statement (2) also and more data is required to answer the question.

34. The best answer is C.

Each one of the villagers, according to the question, has to own at least one of the two dogs.

Statement (1) is insufficient because it says nothing about the Bernard owners.

Statement (2) is insufficient because it says nothing about the Golden Retriever owners.

Combine the statements, all the information we need is present,  $(800 - 300 - 280)$  is equal to the number of people who own both races of dogs.

35. The best answer is B.

Statement (1) gives us data on Y only regardless to X and therefore it's insufficient.

Statement (2) tells us how much is X percent of Y. Make up numbers,  $X = 25$  and  $Y = 100$ . X percent of Y is 25 but we also know how much is Y percent of X, 100 is 400% of 25 and therefore this statement is sufficient by itself.

36. The best answer is A.

From the grade 40 at the end of the first year we learn that his age is 20.

At the end of the second year, he will be 21 and his grade will be

$$(21 \times 2 + \frac{1}{2} \times 40 = 62).$$

At the end of the third year, he will be 22 and his grade will be  $(22 \times 2 + \frac{1}{2} \times 62 = 75)$ .

37. The best answer is B.

The third side of the triangle is larger than 3 (The difference between the other two) and smaller than 15 ( The sum of the other two).

The perimeter is between  $(6+9+3 = 18)$  and  $(6+9+15 = 30)$ . The only answer that is in this range is B.