Hayutin ISEE Practice Test

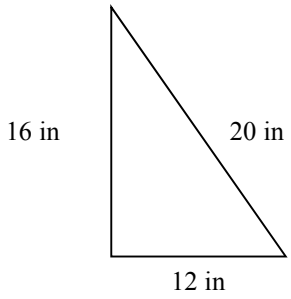
Answer Keys

All Levels

Table of Contents (Click on each link to go to that section!)

Hayutin ISEE practice test – Lower Level MA answer key

1. Use the triangle to answer the question.



What is the perimeter of the triangle?

(A) 24 in

(B) 48 in

(C) 72 in

(D) 96 in

(B) The formula for the perimeter of a triangle is p = s + s + s (perimeter = side + side + side.) So p = 16 + 20 + 12 = 48.

2. A total of 38 students were asked which class they preferred – Math, Science or History. If 27 students said they preferred Math and 6 said they preferred Science, how many students said they preferred History?

(A) 5

(B) 13

(C) 17

(D) 21

(A) The number of students who prefer each subject has to add up to the total, so # who prefer math + number who prefer science + number who prefer history has to = 38. So, 27 + 6 + history = 38. 27 + 6 is 33 and since it takes 5 more to make 38, 5 students prefer history.

3. What is the name of a figure with 5 sides?

(A) triangle

(B) rectangle

(C) square

(D) pentagon

(D) This is just vocabulary – a figure with 5 sides is called a pentagon. If you forgot, you could use the process of elimination…

(A) a triangle has 3 sides

(B) a rectangle has 4

(C) a square has 4

…so a 5 sided figure must be a pentagon.

4. What is the standard form for four hundred six thousand fifty-seven?

(A) 406,057

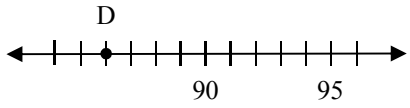
(B) 406,507

(C) 460,570

(D) 465,700

(A) This is just reading numbers. A couple hints: the word "thousand" splits the numbers so the "four hundred six" before it is by itself – 406 and the "fifty-seven" after it is by itself – 57. You need the zero before the 57 to make sure those digits go in the right place value.

5. Use the number line to answer the question.



What number is represented by point D on the number line?

(A) 84

(B) 86

(C) 89

(D) 94

(B) Sometimes number lines go by 2's or 5's so just to be sure, we should count the spaces between 90 and 95. Yup, there are 5 spaces, so this number line goes by 1's (each space is 1 unit.) The point D is 4 spaces behind 90 so it's 86.

6. What is the value of the expression $407 + 298$?

(A) 605

(B) 685

(C) 705

(D) 715

(C) "What is the value of the expression" is fancy math speak for "Do this math." So add 407 and 298.

7. Which expression is equal to 36?

(A) $(4 \times 6) + 5 - 8$

(B) $4 \times (6 + 5) - 8$

(C) $4 \times 6 + (5 - 8)$

(D) $4 \times (6 + 5 - 8)$

(B) For this one you have to test each answer until you find the right one. Remember PEMDAS (but remember – even though "M" is before "D", Multiplication and Division happen at the same time – whichever one comes first in the expression, that's the one you do first. same with Addition and Subtraction.

(A)
$(4 \times 6) + 5 - 8$
$24 + 5 - 8$
$29 - 8$
21
NOPE

(B)
$4 \times (6 + 5) - 8$
$4 \times 11 - 8$
$44 - 8$
36
YEP

8. A group of scientists put 3 metal cups full of water in the sun. Each cup was covered and had a thermometer in it to measure the temperature of the water in degrees Celcius. One cup was painted black, one cup was painted white, and the third was painted blue. The scientists collected the data shown below.

SUN ENERGY EXPERIMENT

Time	Black Cup	White Cup	Blue Cup
Start	10^oC	10^oC	10^oC
20 min	11^oC	10^oC	11^oC
40 min	13^oC	11^oC	12^oC
60 min	15^oC	11^oC	13^oC
80 min	19^oC	12^oC	15^oC
100 min	25^oC	13^oC	18^oC

At 100 minutes, how much warmer was the water in the black cup than in the white cup?

(A) 5^oC

(B) 7^oC

(C) 8^oC

(D) 12^oC

(D) Looking at the chart you can see that the water in the black cup at 100 minutes is 25^oC ***and the water in the white cup at 100 minutes is*** 13^oC***. So do the subtraction 25 – 13 to see how much warmer the water in the black cup is.***

9. Which fraction is equivalent to 0.6?

(A) $\frac{1}{6}$

(B) $\frac{1}{60}$

(C) $\frac{6}{10}$

(D) $\frac{6}{100}$

(C) The "6" in 0.6 is in the "tenths" place so how you would say "0.6" is by saying "6 tenths." See how that is choice (C)?

10. What is the value of the expression $3,000 - 185$?

(A) 2,715

(B) 2,815

(C) 2,915

(D) 3,815

(B) Again, "What is the value of the expression" basically means "Do this math" so let's subtract. There's a lot of borrowing so it gets a little tricky. Just be as neat as you can.

11. If $3 \times (\Delta + 4) = 33$, what number does Δ stand for?

(A) 7

(B) 9

(C) 11

(D) 17

(A) Two ways to do this one. First, you can plug in the answers and see which one works (fortunately, the correct answer is the first answer choice.) Second, you can work backwards like this: 3 x what = 33? 11. Okay, what + 4 = 11? 7

12. Beth buys five things at the store that cost $7.49, $10.99, $0.50, $3.99, and $18.99. What is the estimated total cost of all of these things?

(A) between $25 and $30

(B) between $30 and $35

(C) between $35 and $40

(D) between $40 and $45

(D) Whenever you see "estimate" you're probably going to round. So rounded, those costs become $7, $11, $1, $4 and $19. Adding those together gets you $42.

13. The graph below shows the number of flags sold by four flag stores on the 4th of July.

FLAGS SOLD ON JULY 4TH

Store A	
Store B	
Store C	
Store D	

 = 500 flags

How many more flags were sold by Store A than by Store C?

(A) 300

(B) 500

(C) 1,000

(D) 1,500

(D) On the chart, Store A has 7 flag symbols and Store C has 4. That means that Store A has 3 more flag symbols than Store C. So if each flag symbol represents 500 flags 3 flag symbols represents 3 x 500 flags which is 1500

14. Mt. McKinley has an elevation of 20,322 ft. Which peak has a height closest to $\frac{1}{3}$ of the height of Mt. McKinley?

(A) Mt. Mitchell, which has a height of 6, 684 ft

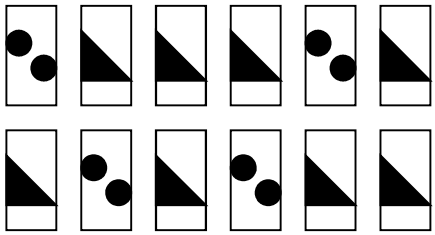
(B) Guadelupe Peak, which has a height of 8,749 ft

(C) Granite Peak, which has a height of 12,799 ft

(D) Mt. Shasta, which has a height of 14,180 ft

(A) To find what 1/3 of 20,322 is we can multiply 20,322 by 1/3 (remember, "of" in math almost always means multiplication) or we can divide 20,322 by 3. Let's go with the division. But the word "closest" in the problem gives us some room to round or change the numbers a bit. We could round 20,322 to 20,000, but that's not divisible by 3 so let's change it to 21,000 instead. 21,000 divided by 3 is 7,000. Looks like choice (A) is closest to that.

15. Each card below has either .a triangle or two circles.



If one of the cards is picked at random, what is the chance that it will have a triangle?

(A) 1 out of 8

(B) 1 out of 4

(C) 1 out of 3

(D) 2 out of 3

(D) "What is the chance" means probability. The probability that something will happen is a fraction:

$$\frac{\#\ of\ ones\ we\ want}{total\ \#}$$

So, since there are 8 cards with a triangle and there are 12 total cards that equals 8/12 which reduces to 2/3 or "2 out of 3."

16. Use the table to answer the question.

SAM'S DIVING SCORES

Front flip	5.3	5.6	5.1	5.7	5.2
Back flip	5.9	5.7	5.3	5.4	5.5
Front double	5.6	5.8	5.3	6.0	5.6
Back 1 ½	5.9	6.1	5.7	6.0	5.6

What is the mode of this set of data?

(A) 5.3

(B) 5.6

(C) 5.7

(D) 6.0

(B) The "mode" is the number that shows up the most. Let's test the answers:

(A) 5.3 shows up3 times in the chart

(B) 5.6 shows up 4 times in the chart

(C) 5.7 shows up 3 times in the chart

(D) 6.0 shows up 2 times in the chart

17. use the set of numbers shown to answer the question.

{ 4, 6, 8, 9, 10, … }

Which describes this set of numbers?

(A) even numbers

(B) odd numbers

(C) prime numbers

(D) composite numbers

(D) Let's test each answer:

(A) Are they all even numbers? No, there's a "9"

(B) Are they all odd numbers? No, 4, 6, 8 and 10 are all even

(C) Are they all prime numbers? No, there are no prime numbers (prime numbers are numbers that are only divisible by themselves and 1 – like 7 and 11 and 13.

(D) Are they all composite numbers? Yes. Even though you probably don't know what a composite number is (they're numbers that can be divided by something other than 1 and themselves) you can still get this by process of elimination.

18. If the area of a rectangle is 30 in^2, which equation can be used to determine the length of that rectangle? ($A = lw$, where A = Area, l = lenth, and w = width)

(A) $l = \frac{30}{w}$

(B) $l = \frac{w}{30}$

(C) $l = 30 - w$

(D) $l = 30 + w$

(A) This may look strange, but let's see if we can make some sense out of it. They tell us that the area of the rectangle is 30. Let's make up a length and width that work for this area. How about a length of 10 and a width of 3? Now let's plug those into the answer choices and see which one works:

(A) This choice says l = 30 / w so let's plug in our values. 10 = 30 / 3 Does that work? Yep. 30 / 3 is 10. You can test the rest of them if you want, but keep in mind you have a time limit on the test.

19. Which fraction is between $\frac{1}{2}$ and $\frac{19}{20}$?

(A) $\frac{1}{4}$

(B) $\frac{1}{5}$

(C) $\frac{3}{7}$

(D) $\frac{2}{3}$

(D) Okay, the key thing you have to know here is that if the numerator of a fraction is more than half of its denominator, then the fraction is more than ½. Think about it this way: If a pizza is cut into 8 pieces and you eat 4 of them then you've eaten 4/8 (or ½ of the pizza). If you eat more than 4, like 5 or 6, then you've eaten more than ½. So, looking through the choices, the only fraction that has a numerator that is more than half of the denominator is (D)

20. Use the number sequence to answer the question.

3, 5, 9, 15, 23, 33, ____

What is the next number in the sequence?

(A) 35

(B) 45

(C) 55

(D) 65

(B) First we need to find the pattern. I usually start with figuring out what you have to add to each term to get the next. From 3 to 5 you add 2, from 5 to 9 you add 4, from 9 to 15 you add 6, from 15 to 23 you add 8, from 23 to 33 you add 10… So, it seems we keep adding the next even number, so since we just added 10 to get to 33, we must add 12 to 33 and get 45.

21. When it is 8:00am in Los Angeles, it is 9:00am in Denver, 10:00am in Dallas and 11:00am in New York. An airplane leaves New York at 2:00pm and arrives 4 hours later in Denver. What time is it in Denver when the plane lands?

(A) 10:00am

(B) 2:00pm

(C) 4:00pm

(D) 6:00pm

(C) First, let's figure everything out using New York time. The flight leaves New York at 2pm and lands 4 hours later. That's 6pm, New York time. Now, Denver is two hours behind New York, so it must be 4pm in Denver at that time.

22. What is the sum of $3.9 + 2.6$?

(A) $5\frac{1}{2}$

(B) $5\frac{4}{5}$

(C) $6\frac{2}{5}$

(D) $6\frac{1}{2}$

(D) First, let's add the decimals. 3.9 + 2.6 = 6.5 Now, let's convert 6.5 into a fraction, since all the answers are fractions. 6.5 is 6 ½

23. What is the perimeter of a rectangle that has a width of 6 centimeters and a length of 9 centimeters? $(P = 2l + 2w)$

(A) 15

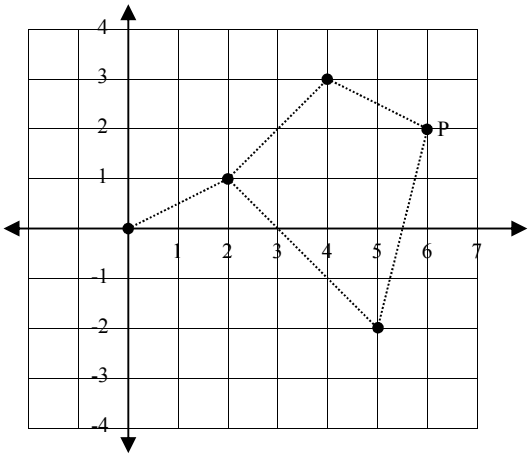
(B) 25

(C) 30

(D) 32

(C) Using the formula, the perimeter equals 2 times the length + 2 times the width, we 2 times 9 + 2 times 6 = 18 + 12 = 30

24. Use the coordinate grid to answer the question.



What are the coordinates of point P on the grid?

(A) $(1,6)$

(B) $(2,6)$

(C) $(6,2)$

(D) $(7,2)$

(C) To get the coordinates of a point start at the origin (where the lines with the arrows meet) and count how far you have to move horizontally to get directly under the point. This is your first number (also known as the x-coordinate.) In our case it's 6. Then, from there count how far you have to move vertically to get to the point. This is your second number (also known as the y-coordinate.) In our case it's 2.

25. Bob had $7\frac{3}{8}$ feet of duct tape. He used $5\frac{3}{4}$ feet to patch a hole in his backpack. How many feet of duct tape does Bob have left?

(A) $1\frac{5}{8}$

(B) $2\frac{1}{8}$

(C) $2\frac{1}{4}$

(D) $2\frac{5}{8}$

(A) This is a subtraction problem – the key word that tells you that is "used." But it's tricky because you have to borrow. Here's what it looks like:

$7\frac{5}{8} - 5\frac{3}{4}$ ***multiply*** $\frac{3}{4}$ ***by*** $\frac{2}{2}$

$7\frac{5}{8} - 5\frac{6}{8}$ ***borrow 1 or*** $\frac{8}{8}$ ***from the 7***

$6\frac{11}{8} - 5\frac{6}{8}$ ***subtract***

$1\frac{5}{8}$

26. Which whole number is divisible by 8 without a remainder?

(A) 1,010

(B) 1,012

(C) 1,014

(D) 1,016

(D) There are short cuts for figuring out divisibility but the one for 8 is so complicated it's just as easy to just divide and see if there's a remainder.

27. Which expression correctly uses the distributive property to solve $17 \times (21 + 5)$?

(A) $(17 \times 21) + 5$

(B) $(5 \times 21) + 17$

(C) $(17 + 21) \times (17 + 5)$

(D) $(17 \times 21) + (17 \times 5)$

(D) Two ways to do this one. First way is figure out what 17 x (21 + 5) is and then see which answer choice gives us the same value:

17 x (21 + 5)
17 x 26
442

Now testing the answer choices:

(A)
(17 x 21) +5
357 + 5
362 NOPE

(B)
(5 x 21) + 17
105 + 17
122 NOPE

(C)
(17 + 21) x (17 + 5)
38 x 22
836 NOPE

(D)
(17 x 21) + (17 x 5)
357 + 85
442 YEP

The other way to do this is if you know the distributive property you know you have to "distribute" (that's where the name comes from) the 17 to both the 21 and the 5 so (D) reflects this property.

28. Bobby is estimating 5.87×4.1 to see if his answer is reasonable. Which of the following is the best calculation for him to use?

(A) 5×4

(B) 6×4

(C) 5×5

(D) 6×5

(B) Estimating means rounding. So, 5.87 rounds to 6 and 4.1 rounds to 4.

29. A program on a computer takes a number that you give it, performs 2 calculations on it and then gives you the result. The table below shows some examples.

COMPUTER PROGRAM DATA

Number given to the computer	Number the computer gives back
30	11
18	7
15	6
9	4
3	2

Which number given to the computer will make the computer give back the number 14?

(A) 33

(B) 36

(C) 39

(D) 45

(C) This one is pretty tough. You basically have to just try a bunch of different stuff. First notice that the numbers get smaller, so we're either subtracting or dividing. Since the numbers get a lot smaller, let's try dividing and let's test the first row. To get from 30 to 11, let's divide 30 by 2.

30 ÷ 2 = 15

Now we have one more calculation (because it tells us the computer performs 2 calculations) to get to 11. I think subtracting by 4 will get us there.

15 – 4 = 11

So let's see if those are the calculations: divide by 2 and subtract 4. We'll test that on the next row.

18 ÷ 2 = 9

9 – 4 = 5

But the calculations should have gotten us a 7 so that rule doesn't work. Back to the drawing board. Let's try dividing by 3 instead and go back to the first row.

30 ÷ 3 = 10

Now to get to the 11 that the 30 is matched with we add 1

10 + 1 = 1

Now let's test that rule (dived by 3 and add 1) on the next row.

18 ÷ 3 = 6

6 + 1 = 7

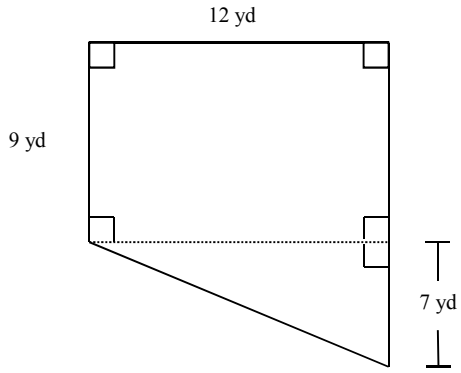
Excellent! And if you try that rule on the rest of the rows, you'll find that it works. Now, test the answer choices with that rule (divide by 3, then add 1) you'll find that 39 works:

39 ÷ 3 = 13

13 + 1 = 14

30. Below is the plan of the area for the new playground at Monroe Elementary School.

MONROE PLAYGROUND



According to the plan, what is the area of the new playground?

(A) 84 yd^2

(B) 108 yd^2

(C) 150 yd^2

(D) 343 yd^2

(C) To do this, let's find the area of the rectangle and the area of the triangle and then add the two areas. For the rectangle:

$A = l \times w$

$A = 12 \times 9$

$A = 108$

For the triangle:

$A = \frac{1}{2} \times b \times h$

$A = \frac{1}{2} \times 12 \times 7$

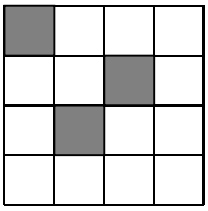
$A = 6 \times 7$

$A = 42$

Adding the two areas 108 + 42 = 150

Hayutin ISEE practice test – Lower Level QR answer key

1. The largest square below is divided into small squares.



What fraction of the largest square is shaded?

(A) $\frac{3}{16}$

(B) $\frac{3}{8}$

(C) $\frac{1}{4}$

(D) $\frac{1}{3}$

(A) The fraction of the largest square that is shaded $= \frac{\text{\# of shaded squares}}{\text{total \# of squares}} = \frac{3}{16}$

2. Which story best fits the equation $8 \times 4 = 32$?

(A) I have 32 pencils. If I lose 4 of them, how many pencils will I have left?

(B) I want to share 32 pencils with 15 friends. How many pencils do we each get?

(C) I have 8 packs of pencils, with 4 pencils in each. How many pencils do I have altogether?

(D) I have 8 packs of pencils, and my friend has 4 packs of pencils. How many packs of pencils do we have altogether?

(C) Create equations for each answer:

(A) 32 – 4 = 28 NOPE

(B) 32 / 16 = 2 NOPE

(15 friends plus me = 16)

(C) 8 x 4 = 32 YEP

3. Betty thought of a number greater than 9 and less than 13. When James tried to guess the number, Betty told him it was greater than 11 and less than 15. What is Betty's number?

(A) 10

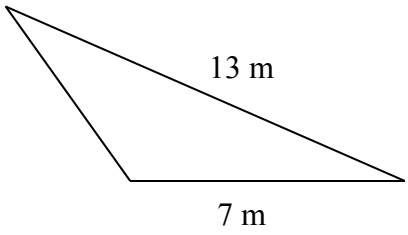
(B) 12

(C) 13

(D) 14

(B) Both of Betty's hints have to be true. Her first hint says that the number is greater than 9 and less than 13. That means the number could be *10, 11 or 12.* ***Her second hint says that the number is greater than 11 and less than 15. That means the number could be*** *12, 13 or 14.* ***The only number that both hints include is 12.***

4. The perimeter of the triangle is 31 meters. The lengths of two of the sides are shown.



What is the length of the third side?

(A) 11 meters

(B) 19 meters

(C) 37 meters

(D) 47 meters

(A) The formula for the perimeter of a triangle is side + side + side = perimeter. So 13 + 7 + third side = 31. If you add the 13 and 7 you get 20 + third side = 31. If you can do that in your head, you'll get 11. If not you can do subtraction: 31 – 20 = 11. If you know Algebra already, you can make an equation and solve it.

$$13+7+x=31$$
$$20+x=31$$
$$-20 \quad -20$$
$$x=11$$

5. Use the equations to answer the question.

$$6 + r = 8$$
$$4 + s = 8$$

What is the sum of $r + s$?

(A) 6

(B) 10

(C) 16

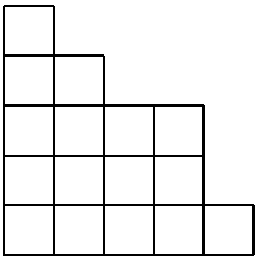
(D) 26

(A) You'll need to solve both equations for their variables:

$$\begin{array}{rr} 6+r=8 & \qquad 4+s=8 \\ -6 \quad -6 & \qquad -4 \quad -4 \\ r=2 & \qquad s=4 \end{array}$$

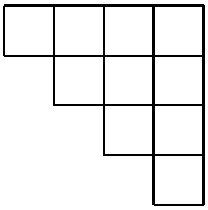
So then r + s = 2 + 4 = 6

6. Use the diagram to answer the question.

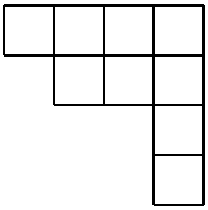


Which piece would complete the diagram to make a square?

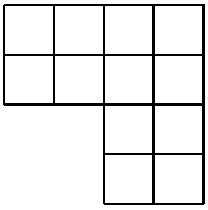
(A)



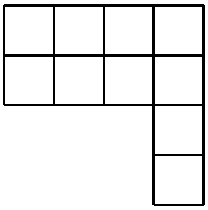
(B)



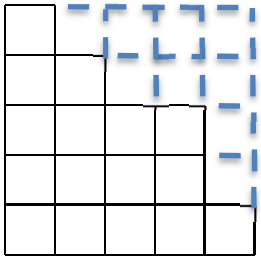
(C)



(D)



(B) This one is a little tough to explain… Let's try this. Fill in the diagram with your pencil to make the square like this:



Then look to see which of the answer choices matches your pencil drawing. Notice the first column has 1 square, the next two columns have 2 and the last column has 4.

7. Shirin and Andy were riding their scooters at the same speed on the boardwalk. It took Shirin 18 minutes to ride 3 miles. How long did it take Andy to ride 12 miles?

(A) 54 minutes

(B) 72 minutes

(C) 90 minutes

(D) 126 minutes

(B) The key info here is that Shirin and Andy are riding at the same speed. Since speed = distance / time that means Shirin went 3/18 miles per minute. Yuck. Hmm... Let's do something different. Let's reason this out. If Shirin took 18 minutes to ride 3 miles then that means it took her 6 minutes to ride 1 mile. 6 minutes per mile. Okay, so Andy would ride 6 minutes per mile too. If he rode 12 miles, that's 6 minutes x 12 miles = 72 minutes.

8. Which is the largest fraction?

(A) $\frac{6}{11}$

(B) $\frac{6}{13}$

(C) $\frac{8}{17}$

(D) $\frac{9}{19}$

(A) This one is tricky. The best way to do this is to compare each fraction with ½. Then keep in mind that when the denominator INCREASES, the value of the whole fraction DECREASES. If that sounds weird, use a ridiculous example like this: take ½, then increase the denominator a lot, like this: 1/100. ½ is definitely larger than ½, right? See – increasing the denominator decreases the value of the fraction. Cool, huh? Okay let's try this out:

(A) Okay, let's find the ½ here. It would be 6/12. Since the 12 DECREASES to 11 to make 6/11, that means 6/11 is LARGER than ½.

(B) Again, let's find the ½. It would be 6/12 again. Since the 12 INCREASES to 13 to make 6/13, that means 6/13 is SMALLER than ½. So far, (A) is our answer.

(C) The ½ here would be 8/16. The 16 is INCREASED to 17 to make 8/17, so 8/17 is SMALLER than ½. (A) is still our answer.

(D) The ½ here would be 9/18. The 18 is INCREASED to 19 to make 9/19, so 9/19 is SMALLER than ½. (A) is our answer since it is the only one larger than ½.

9. If n can be divided by both 2 and 7 without leaving a remainder, then n can also be divided by which number without leaving a remainder?

(A) 5

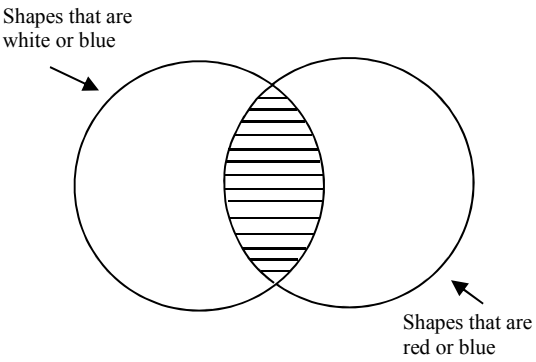
(B) 9

(C) 10

(D) 14

(D) The best thing to do here is come up with a number that satisfies the conditions (that's fancy math speak for "a number that can be divided by both 2 and 7 without leaving a remainder). The first number I can think of that can be divided evenly by both 2 and 7 is 14. The only number from the choices that goes into 14 evenly is 14 itself.

10. Use the Venn diagram to answer the question.



What shapes could be found in the shaded part of the Venn diagram?

(A) a white circle

(B) a red circle

(C) a red rectangle

(D) a blue rectangle

(D) In a Venn diagram, the overlapping portion contains items that fit in both circles. The items that fit in both circles are items that are blue.

11. A group of scientists put 3 metal cups full of water in the sun. Each cup was covered and had a thermometer in it to measure the temperature of the water in degrees Celsius. One cup was painted black, one cup was painted white, and the third was painted blue. The scientists collected the data shown below.

SUN ENERGY EXPERIMENT

Time	Black Cup	White Cup	Blue Cup
Start	10^oC	10^oC	10^oC
20 min	11^oC	10^oC	11^oC
40 min	13^oC	11^oC	12^oC
60 min	15^oC	11^oC	13^oC
80 min	19^oC	12^oC	15^oC
100 min	25^oC	13^oC	18^oC

According to the pattern from these data, what would be the predicted temperature of the water in the blue cup at 140 min?

(A) 18^oC

(B) 19^oC

(C) 21^oC

(D) 24^oC

(D) 140 min is TWO steps from 100 min (because notice each step increases 20 minutes so 40 minutes would be TWO steps). That's the key here. If you noticed that from 80 min to 100 min that temp rose 3^oC ***good. But remember you have to add 2 of them. 18 + 3 + 3 =*** 24^oC

12. Use the table to determine the rule.

Input	Output
Σ	Ω
3	9
9	15
14	20
35	41

What is the rule for this function?

(A) $\Sigma \times 3 = \Omega$

(B) $(\Sigma \times 2) - 1 = \Omega$

(C) $\Sigma + 4 = \Omega$

(D) $\Sigma + 6 = \Omega$

(D) If you haven't had any Algebra yet, this is going to look crazy. But it's pretty simple really. The Σ ***and*** Ω ***are just symbols representing "Input" and "Output". So what are we doing to the Input to get the Output. You could test the answers, but I like a little trial and error here. the first line has an Input of 3 and an Output of 9 so maybe we multiply by 3. But the next line has an Input of 9 and an Output of 15. 9 x 3 = 27, not 15. Okay, let's try adding. For the first line it looks like we're adding 6 to 3 to get 9, so let's try adding 6 to all the Inputs. Yup. Excellent. By the way, notice how "x 3" is the first answer. Sneaky ISEE – they're trying to trick you.***

13. The perimeter of a square is $12s$. What is the length of one side?

(A) 3

(B) 6

(C) $3s$

(D) $6s$

(C) Okay, you get the perimeter of any figure (except rounded ones like circles) by adding the sides. For a square all the sides are the same so we can just divide 12s by 4. That gets us 3s. If you haven't had Algebra yet, this might not make sense. Try thinking of it this way: if you have 12 things called "s" and you wanted to divide them into 4 equal groups, you'd have 3 things called "s" in each group = 3s. That's not exactly mathematically accurate but it'll work for now until you have some Algebra.

14. Which is a value of x in the math equation $24 = 4x + 4$?

(A) 1

(B) 4

(C) 5

(D) 6

(C) Algebra method:

$$\begin{aligned} 24 &= 4x + 4 \\ -4 &\quad -4 \\ 20 &= 4x \\ \div 4 &\quad \div 4 \\ 5 &= x \end{aligned}$$

Non-Algebra method: plug in the answers.

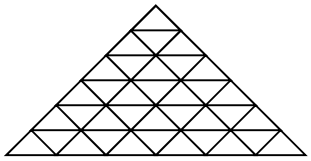
(A) 24 = 4(1) + 4 NOPE

(B) 24 = 4(4) + 4 NOPE

(C) 24 = 4(5) + 4 YEP

(D) 24 = 4(6) + 4 NOPE

15. Use the figure below to answer the question.



If two more rows were added to the figure, how many small triangles would the eighth row have, assuming the same pattern continues?

(A) 9

(B) 11

(C) 13

(D) 15

(D) Sometimes charts are helpful for pattern problems. Let's try one:

ROW	***# of TRIANGLES***
1	***1***
2	***3***
3	***5***
4	***7***
5	***9***
6	***11***
7	***13***
8	***15***

16. Use the pattern to help answer the question.

$$2^2 - 1^2 = 3$$
$$3^2 - 2^2 = 5$$
$$4^2 - 3^2 = 7$$

What is the solution to $9^2 - 8^2$?

(A) 15

(B) 17

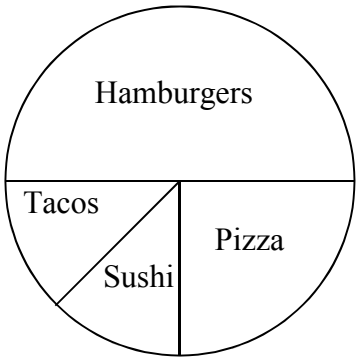
(C) 19

(D) 21

(B) Another pattern problem – and they already started the chart for us. Let's just continue it:

$$2^2 - 1^2 = 3$$
$$3^2 - 2^2 = 5$$
$$4^2 - 3^2 = 7$$
$$5^2 - 4^2 = 9$$
$$6^2 - 5^2 = 11$$
$$7^2 - 6^2 = 13$$
$$8^2 - 7^2 = 15$$
$$9^2 - 8^2 = 17$$

17. A survey of 80 students' favorite foods is displayed in the circle graph below.



About what fraction of the students chose tacos as their favorite food?

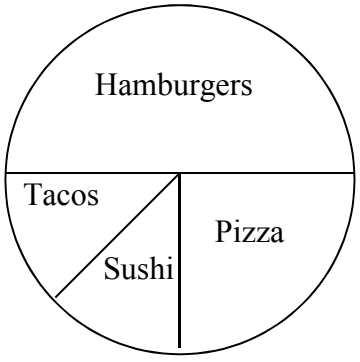
(A) $\frac{1}{8}$

(B) $\frac{1}{4}$

(C) $\frac{1}{3}$

(D) $\frac{1}{2}$

********(A) I like to draw on the figure for problems like this:***



Tacos is one piece out of an 8 piece pie = 1/8

18. A dog had a litter of 5 puppies. Two of the puppies weighed 3 ½ ounces each, 2 puppies weighed 4 ounces, and 1 puppy weighed 5 ounces. What is the mean weight of the puppies from the litter?

(A) 3 ½ ounces

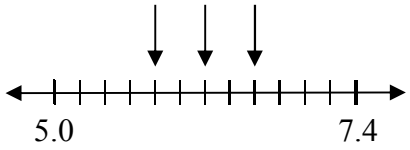
(B) 4 ounces

(C) 4 ½ ounces

(D) 5 ounces

(B) "Mean" means average. So we add up the weights of all 5 puppies and then divide by 5. 3 ½ + 3 ½ + 4 + 4 + 5 = 20 then 20 divided by 5 = 4

19. Use the number line to answer the question.



Which three numbers are the vertical arrows pointing to on the number line?

(A) 5.2, 5.4, 5.6

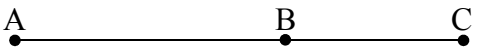
(B) 5.4, 5.8, 6.2

(C) 5.8, 6.2, 6.6

(D) 6.2, 6.6, 7.0

(C) The key here is to count the SPACES, not the LINES. From 5.0 to 7.4 there are 12 spaces. Now, the distance from 5.0 to 7.4 is 2.4 (just subtract 7.4 – 5.0). Then divide 2.4 by 12 and you'll get that every space is 0.2 long. The first vertical arrow is pointing at the line 4 spaces from 5.0 and 4 times 0.2 = 5.8 so 5.8 is the first arrow and (C) is the only answer that starts with 5.8.

20. The length of AB is x and the length of AC is y.



What is the length of BC?

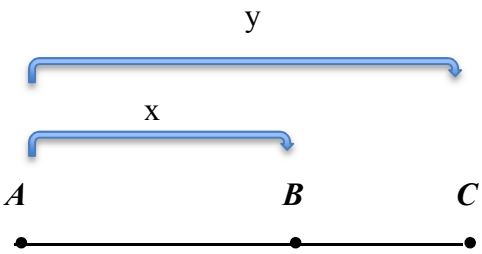
(A) $x+y$

(B) $x-y$

(C) $y-x$

(D) xy

(C) They're trying to trick you by giving you the information in a weird order. Just label the picture like this:



Then it becomes pretty clear that BC is y – x

21. In a warehouse, there are 786 boxes with 48 cups in each box. Which expression gives the best estimate of the total number of cups in the warehouse?

(A) 79×50

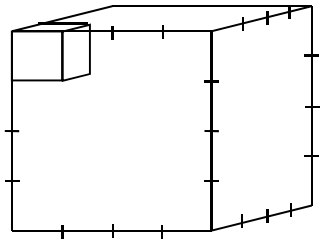
(B) 80×50

(C) 700×40

(D) 800×50

(D) Whenever you see the word "estimate" chances are you're going to round. 786 rounds to either 790 or 800. I don't see a 790 so it looks like (D) is the only possible answer.

22. The volume of the small cube is 1 unit ^{3}.



What is the volume of the larger cube?

(A) 9 units ^{3}

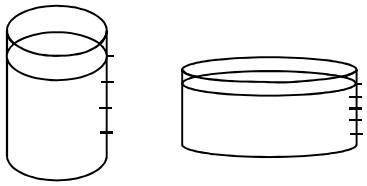
(B) 16 units ^{3}

(C) 32 units ^{3}

(D) 64 units ^{3}

(D) If you can visualize, you're in good shape. 4 boxes across the top edge and 4 boxes down and 4 boxes deep = 4 x 4 x 4 = 64. If you can't really see that, you'll have to know that V = lwh so if that little box's V = 1, then it's l =1, w = 1 and h = 1. From that you can see that the l, w and h of the big box are all 4 as well. Then V = lwh = 4 x 4 x 4 = 64

23. Jar A and Jar B each hold 1 cup of liquid when filled to the top. The jars shown are not completely filled to the top.



If the liquids in the jars are combined, approximately how much liquid will there be altogether?

(A) ¾ cup

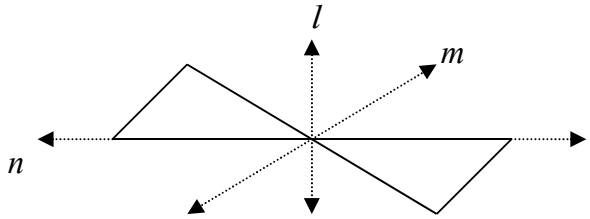
(B) 1.75 cups

(C) 2.5 cups

(D) 5 cups

(B) If you want to be precise you can say that the tall jar is filled 4/5 full and the short jar is filled 5/6 full. Then you can convert 4/5 and 5/6 into decimals (since the answers are in decimals) and add. BUT, let's use the multiple choice to our advantage and estimate. The tall jar has almost a cup and the short jar has almost a cup so added together makes almost 2 cups. (B) is the only answer that's almost 2 cups.

24. The figure shown may be folded along one or more of the dotted lines.



Which line or pair of lines, when folded, will allow the triangles to exactly match the original figure?

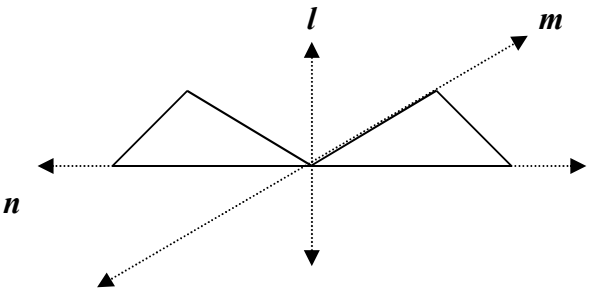
(A) line *n* only

(B) line *m* only

(C) both line *n* and line *m*

(D) both line *n* and line *l*

(D) This one is tricky if you can't visualize it. I'll show you the first fold across line n:



See how if you fold on line l now, the two triangles will match up?

25. The ingredients in the recipe were evenly mixed and equally divided into 8 bags.

RECIPE
12 cups of Cheerios
10 cups of dried cranberries
6 cups of yogurt covered raisins
5 cups of peanuts
4 cups of mini pretzels

Approximately how many cups of the mixture were placed in each bag?

(A) 4

(B) 4 ½

(C) 5

(D) 5 ½

(B) If you add the measures of all the ingredients you get 37 cups of mixture. Divide that by 8 because there are 8 bags. 37 divided by 8 doesn't come out evenly. But if we make it the improper fraction 37/8 and then convert it into the mixed number 4 5/8 then you can see that that's about 4 ½. OR if you notice that 32/8 = 4 and 40/8 =5 and 37 is in between 32 and 40 then 37/8 is between 4 and 5, so 4 ½ is a good guess.

26. The scale on Lisa's map says that 1.4 inches on the map represents 20 miles. How many inches would it take to represent 50 miles?

(A) 3.0

(B) 3.5

(C) 4.2

(D) 4.9

(B) 1.4 inches = 20 miles is the scale of the map, but it's a little hard to work with. Why don't we divide both of them by 2 to get 0.7 inches = 10 miles. 10 is much easier to work with than 20. So, if 0.7 inches = 10, then we can multiply both by 5 to get 3.5 inches = 50.

27. Mr. Jones put all of the names of his employees in a hat. The probability that he will pull out a woman's name at random is 5 out of 9. There are 20 men in his company. How many women are in Mr. Jones' company?

(A) 16

(B) 20

(C) 25

(D) 45

(C) The probability that something will happen is a fraction: $\frac{\#\ of\ ones\ we\ want}{total\ \#}$

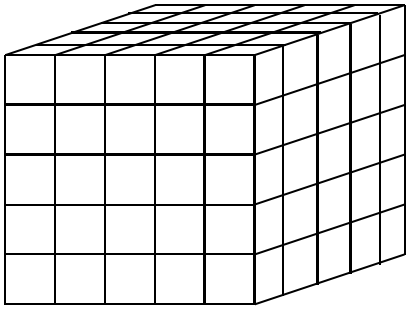
This problem is tricky though. You need some pretty tricky Algebra or you can test the answer choices. Let's test the answer choices. To do this, put the number of women over the total number.

(A) 16 / (16+20) = 16 / 36 = 4 / 9 NOPE

(B) 20 / (20 + 20) = 20 / 40 = ½ NOPE

(C) 25 / (25 + 20) = 25 / 45 = 5 / 9 YEP!

28. Use the diagram of the cube to answer the question.



How many small cubes were used to build the large cube?

(A) 50

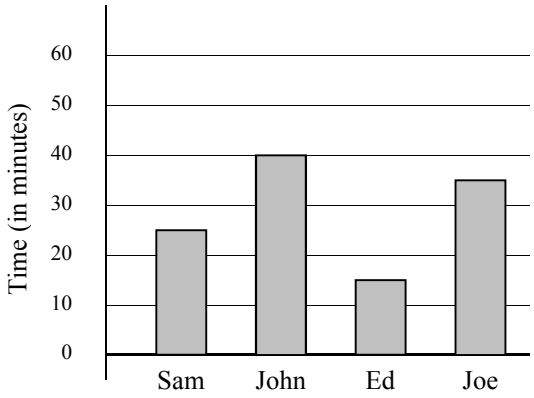
(B) 75

(C) 125

(D) 150

(C) If we count the small cubes on the front face, there are 25 (5 across and 5 up and down = 25 or just count them.) Then, the large cube is 5 cubes deep so we'll multiply 25 x 5 = 125

29. Four 6th Graders recorded the number of minutes spent doing math homework for one night and recorded their data in the graph below.



Based on the information in the graph, which conclusion is true about the number of minutes spent doing math homework?

(A) The mean is between 28 and 29.

(B) John did math homework for fewer minutes than Sam.

(C) The range is greater than the number of minutes Joe spent doing math homework.

(D) Joe did math homework for twice as many minutes as Ed.

(A) Check each answer choice:

(A) The mean is the average so we have to add all the data and then divide by 4. The graph isn't very precise but let's say Sam spent 25 minutes, John 40, Ed 15 and Joe 35. Add them all up and you get 115 and 115 divided by 4 = 28.75 so (A) is the right answer (if you want to be extra sure, you can check the other answer choices, but that might take too much time.)

30. Which equation can be read as "8 more than 3 times a number is equal to 5 less than the number"? Let m represent the unknown number.

(A) $8+(3\times m)=5-m$

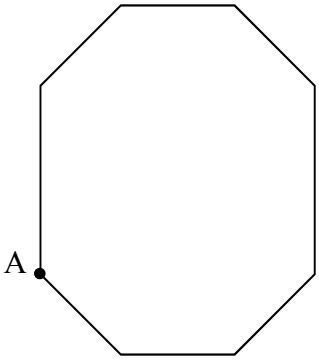
(B) $8+(3\times m)=m-5$

(C) $8\times(3\times m)=5-m$

(D) $8\times(3\times m)=m-5$

(B) For this one it's good to look at all the answer choices first, to see what we're dealing with. (A) and (B) have 8 + something and (C) and (D) have 8 x something. "8 more than" means 8 + so we can eliminate (C) and (D). The difference between (A) and (B) is in the order of the 5 and the m. "5 less than the number" actually means m – 5 so (B) is the answer. If you're confused as to why you switch the order think about a real life example. 8 less than 10 means 10 – 8, not 8 – 10

31. Use the figure below to answer the question.



How many triangles can be made in the figure just by drawing line segments from vertex A to the other vertices?

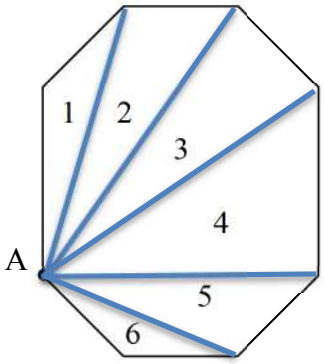
(A) 5

(B) 6

(C) 7

(D) 8

*****(B) Let's draw them and then count:*



32. Esperanza has a folder with sheets of colored paper: blue, red, orange, brown, purple and green. The probability of her choosing an orange piece of paper without looking is 3 out of 8. Which combination of pieces of paper is possible?

(A) 3 orange sheets and 8 others

(B) 12 orange sheets and 32 others

(C) 14 orange sheets and 7 others

(D) 18 orange sheets and 30 others

(D) Remember, probability is:

$$\frac{\#\ of\ ones\ we\ want}{total\ \#}$$

So, let's test the answers

(A) 3 / (3 + 8) = 3 / 11 (or, said another way, 3 out of 11) NOPE

(B) 12 / (12 + 32) = 12 / 44 (which, reduced to lowest terms is 3 / 11) NOPE

(C) 14 / (14 + 7) = 14 / 21 (which, reduced to lowest terms is 2 / 3) NOPE

(D) 18 / (18 + 30) = 18 / 48 (which, reduced to lowest terms is 3 / 8) YEP

By the way, we have to add for the denominator because the denominator is the total #, which would equal the orange sheets + the others.

33. Evan did the problem below with his calculator.

$$\frac{61 \times 847}{31}$$

What is a reasonable estimation for his answer?

(A) between 1,000 and 1,300

(B) between 1,300 and 2,000

(C) between 2,000 and 2,300

(D) between 2,300 and 3,000

(B) Estimation almost always means rounding, so let's round the numbers like this:

$$\frac{60 \times 800}{30}$$

Which equals1600. Quick hint – since it's all multiplication on top you can shortcut this by dividing 60 by 30 and getting 2, then multiplying the 2 by 800 to get 1600

34. What is the value of a in the expression below?

$$\frac{40(25+35)}{4} = a$$

(A) 300

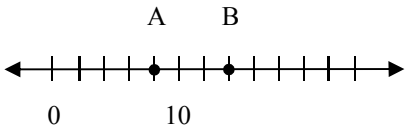
(B) 600

(C) 800

(D) 1,600

(B) Don't let the "a" fool you – this is straightforward problem. Just simplify the big fraction, making sure you follow PEMDAS. First add 25 + 35 to get 60. Then multiply 40 x 60 to get 2400, then divide by 4 to get 600.

35. Use the number line shown to answer the question.



B is the average of A and another number.

What is the other number?

(A) 3

(B) 6

(C) 16

(D) 20

(D) First, let's figure how far it is between marks – the SPACES in between the marks. The mistake that most people make with these problems is counting the MARKS instead of the SPACES. So, there are 5 spaces between 0 and 10 so 10 divided by 5 makes each space = 2. So then A is at 8 and B is at 14. B is the average of A and another number so 8 + that other number, divided by 2 has to get us 14. Let's test the answers:

(A) 8 + 3 = 11 divided by 2 does not equal 14

(B) 8 + 6 = 14 divided by 2 does not equal 14

(C) 8 + 16 = 24 divided by 2 does not equal 14

(D) 8 + 20 = 28 divided by 2 does equal 14

36. Elizabeth is ordering a pen for each person that works in her company. She knows how many people work in her company and she knows how many pens come in every pack. How would she figure out how many packs (p) of pens to order?

(A) $p =$ the number of packs $\times$ the number of pens per pack

(B) $p =$ the number of packs $+$ the number of pens per pack

(C) $p =$ the number of workers $\div$ the number of pens per pack

(D) $p =$ the number of workers $-$ the number of pens per pack

(C) The easiest way to do this is to make up some numbers for the info that she knows. So let's say there are 10 people that work in her company and that 2 pens come in every pack (that's a small company and a small pack of pens, but I like those numbers bc they're small and bc 2 goes into 10 evenly.) So the number of packs to order is 5 because 10 divided by 2 equals 5.

37. The total combined weight of a book, a stapler and a box of pencils is 30 ounces. If the book weighs the same as 2 boxes of pencils and the stapler weighs the same as 3 boxes of pencils, how may ounces does a box of pencils weigh?

(A) 2 ounces

(B) 3 ounces

(C) 5 ounces

(D) 6 ounces

(C) Wow… Let's just test the answer choices:

(A) Ok, a box of pencils weighs 2 so the stapler weighs 3 x 2 = 6 and the book weighs 2 x 2 = 4. That adds up to 12. NOPE

(B) A box of pencils weighs 3 so the stapler weighs 3 x 3 = 9 and the book weighs 2 x 3 = 6. That adds up to 18. NOPE

(C) A box of pencils weighs 5 so the stapler weighs 3 x 5 = 15 and the book weighs 2 x 5 = 10. That adds up to 30. YEP

38. The points with coordinates $(2,1)$ $(2,4)$ $(5,1)$ and $(5,4)$ are the vertices of a quadrilateral. If all four points are connected to form the quadrilateral, which term best describes the quadrilateral formed?

(A) triangle

(B) trapezoid

(C) square

(D) pentagon

*****(C) For this one, make the best drawing you can:***

Hayutin ISEE practice test – Middle Level MA answer key

1. What is the sum of $56,789 + 98,765$?

(A) 144,444

(B) 154,444

(C) 155,454

(D) 155,554

(D) This is just testing your adding skills and if you can keep all the numbers straight.

2. Which expression is equal to 10?

(A) $(2 \times 6) + 3 - 8$

(B) $2 \times (6 + 3) - 8$

(C) $2 \times 6 + (3 - 8)$

(D) $2 \times (6 + 3 - 8)$

(B) Let's test them:

(A) *(2 x 6) + 3 – 8*

12 + 3 – 8

15 – 8

7 ***NOPE***

(B) *2 x (6 + 3) – 8*

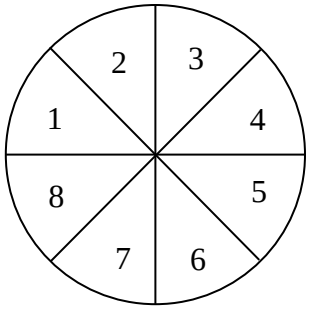
2 x 9 – 8

18 – 8

10 ***YEP!***

I will sometimes simplify the other answer choices just to be sure, but then I'd be leaving less time for the other problems, so that might be counterproductive.

3. The circle below is divided into parts.



How much of the circle has factors of 6?

(A) $\frac{1}{2}$

(B) $\frac{2}{3}$

(C) $\frac{3}{4}$

(D) $\frac{4}{5}$

(A) The "factors" of 6 are all the numbers that go into 6. So, since 1 x 6 = 6 and 2 x 3 = 6, the factors of 6 are 1, 2, 3, and 6 which is 4 of the 8 numbers in the circle. 4 out of 8 is 4/8 which is equal to 1/2.

4. Which number has no positive factors except for 1 and itself?

(A) 16

(B) 21

(C) 27

(D) 29

(D) Let's test them.

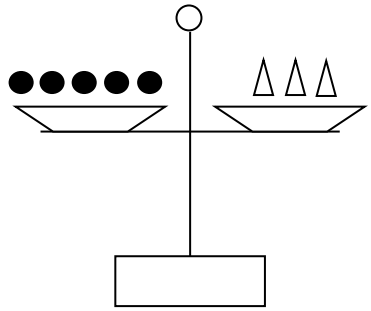
(A) 16 has the factors 1, 2, 4, 8, and 16. That's more than 1 and itself so NO on this one.

(B) Factors of 21: 1, 3, 7, and 21 so NO on this one too.

(C) Factors of 27: 1, 3, 9, and 27 so NO on this one as well.

(D) Factors of 29: 1, 29… Yeah, nothing else goes into 29 so 29 "has no positive factors except for 1 and itself."

5. Use the balance scale diagramed below to answer this question.



In the figure shown, if 5● = 3△ and one △ is 20, what is the value of one ● ?

(A) 3

(B) 5

(C) 12

(D) 60

(C) This is a tricky looking one, but it's just a substitution problem. Since one △ is equal to 20, we can substitute 20 in for △ in the equation 5● = 3△

This gets us *5 ● = 3 (20)*
5 ● = 60
● = 12

6. Edith scored an average of 15 points per game during the 12 game regular season. If her highest scoring game was 21 and the range of her scores was 8, what was her lowest score?

(A) 8

(B) 12

(C) 13

(D) 14

(C) You just need to know the vocab for this one. The "range" of a set of scores is how much space there is between the lowest score and the highest score. You get it with the following formula:

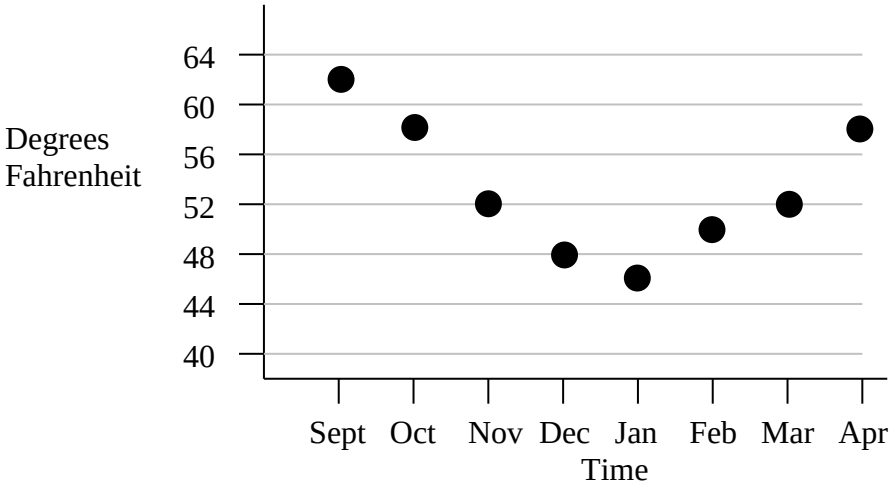
Highest score – Lowest score = range

21 – x = 8

– x = – 13

x = 13

7. The students in Mr. Cho's class checked the average monthly temperature for their hometown and made the graph below.



What was the difference between the lowest and the highest temperatures recorded?

(A) 12^o

(B) 16^o

(C) 22^o

(D) 26^o

(B) You get the difference between the lowest and highest temperatures by subtracting:

highest – lowest

62 – 46

16

8. If $P = (L + W) \times 2$, then what is P when L is 15 inches and W is 17 inches?

(A) 32 inches

(B) 38 inches

(C) 52 inches

(D) 64 inches

(D) Follow the formula, filling in the appropriate values:

P = (L + W) x 2

P = (15 + 17) x 2

P = 32 x 2

P = 64

9. Mrs. Hernandez asked her students to estimate the answer to the expression $(59 \times 71) \div 400$. Which estimate is the closest?

(A) 4

(B) 10

(C) 40

(D) 100

(B) Whenever you see the word "estimate" you're going to round the numbers and then perform the operations:

59 x 71 ÷ 400

60 x 70 ÷ 400

4200 ÷ 400

This doesn't work out evenly. Let's round again.

4000 ÷ 400

10

10. Jack and Sophia worked for 4 days and used the following table to keep track of how much they made, in total.

Day	Jack's Total	Sohpia's Total
1	$16.50	$17.80
2	$26.00	$26.60
3	$35.50	$35.40
4	$45.00	$44.20

After day 1, how much did Sophia earn each day?

(A) $8.80

(B) $9.10

(C) $9.20

(D) $9.80

(A) Looking at the chart you might be tempted to say she made $26.60 on day 2, but you'd be reading the chart incorrectly. The chart keeps track of the TOTAL that they've made. So to figure out how much she made that day, you'd have to subtract the previous day. To see how much she made on day 2, you'd take the figure from day 2 of the chart, which is $26.60, and then subtract day 1, which is $17.80.

$26.60 – $17.80 = $8.80

You can check day 3 and 4 by subtracting day 2 and 3 respectively and you'll see that you'll get $8.80 each time. So that's how much she made every day after day 1.

11. Which is equivalent to the expression $\frac{80(53+47)}{4}$

(A) 1,344

(B) 2,000

(C) 2,846

(D) 8,000

(B) Follow your order of operations like this:

$\frac{80\ (53+47)}{4}$

$\frac{80\ (100)}{4}$

$\frac{8000}{4}$

2000

12. This year, Jude's chores have increased by two and a half times his amount of chores from last year. By what percent did his chores increase?

(A) 2.5%

(B) 150%

(C) 250%

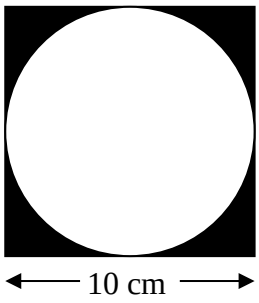
(D) 350%

(C) Okay, we've got to keep our vocab straight here. If Jude's chores "increased by two and a half times" that means they increased by 250%. It might be helpful to think about it like this:

Increasing by half (like going from 10 chores to 15 chores per week or something like that) would be a 50% increase.

The tricky part is if it had said "Jude has tow and a half times as many chores as he had last year," that would be only a 150% increase. But maybe I'm just confusing you now…

13. In the figure, a circle is inscribed inside a square.



What is the area of the shaded region? (area of a circle = ρr^2)

A) $40 - 10\rho$ cm^2

(B) $40 - 25\rho$ cm^2

(C) $100 - 10\rho$ cm^2

(D) $100 - 25\rho$ cm^2

(D) You'll solve most "find the area of the shaded region" problems in the same way. Find the area of the outside figure (the larger one – in this case, the square) and subtract the area of the inside figure (in this case the circle.)

Square: $A = l \times w = (10)(10) = 100$

Circle: (can you see that the radius is half of one side of the square = 5 cm?)

$A = \pi r^2$

$A = \pi (5)^2$

$A = 25\pi$

So the area of the shaded region is:

$A = 100 - 25\pi$

14. There are 6 more boys than girls in the 5th grade. If there are 12 girls, what fraction of the 5th grade is girls?

(A) $\frac{2}{5}$

(B) $\frac{1}{2}$

(C) $\frac{3}{5}$

(D) $\frac{2}{3}$

(A) Okay the fraction of girls will be:

 # girls / total #

We know the # girls is 12, so we need the total #. To get this we need to add the boys and the girls so we need the # boys. There are 6 more boys than girls so there are 18 boys. That makes the total # in the class:

 # girls + # boys

12 + 18

30

So the fraction of girls is 12/30, which reduces down to 2/5

15. The amount of money, y, in Eva's savings account depends on the number of weeks, x, that she spends working, according to the formula, $y = 225x + 120$. What does the 120 signify in this formula?

(A) For every 120 hours spent working, $1 is saved.
(B) For every 1 hour spent working, $120 is saved.
(C) When 0 hours are spent working, $120 is saved.
(D) When 225 hours are spent working, $120 is saved.

(C) This one is tricky. I don't see anything in the problem that tells us what that $120 stands for, so let's figure out the rest of the numbers and variables to see if we can figure out what $120 is by the process of elimination.

y = amount in her savings account

x = number of weeks she works

225 = well, since this is multiplied by x, this must be how much she makes each week.

120 = I'm guessing that since this is not multiplied by x, then it's not money from work, so maybe this is how much she had in the savings account at the beginning? Something like that? Looking through the answers there's nothing that says that, but (C) actually works. If we substitute 0 in for x, we do get $120 in the account. Odd problem, huh?

16. On a map, 6 centimeters equals 200 kilometers. If two locations are 15 centimeters apart on the map, what is their actual distance apart?

(A) 50 km

(B) 500 km

(C) 800 km

(D) 2000 km

(B) Two ways to solve this one. First way, with a proportion:

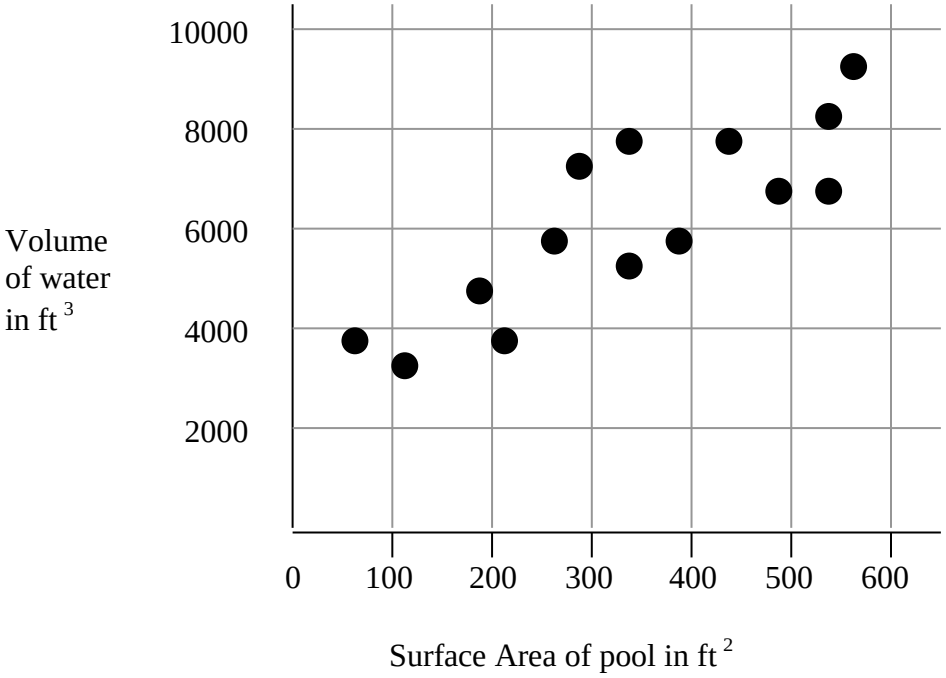
$$\frac{6\ cm}{200\ km} = \frac{15\ cm}{x}$$

$$6x = 3000$$

$$x = 500$$

Second way is using some reasoning. If 6 cm = 200 km, then 12 cm = 400. To get to 15 cm we need 3 more cm, or half of the original 6 cm. So we add half of the original 200 km which is 100 km. So we add that 100 km to the 400 km to get 500 km. Or, another way to think of it is, if 6 cm = 200 km, then 3 cm = 100 km. We multiply both by 5 to get 15 cm = 500 km. Lots of ways to play with this.

17. How much water would a 300 ft^2 pool hold, according to the scatter plot?



(A) 4,000 ft^3

(B) 6,000 ft^3

(C) 8,000 ft^3

(D) 10,000 ft^3

(B) We look at the 300 ft^2 on the x-axis (the horizontal one) and head up that line to the middle of where the points are. You can see that it is pretty spot on at 6000 ft^2

18. A bag contains 2 red, 1 white, and 2 blue marbles. A marble is selected at random, replaced, and then a second marble is selected. Which of the following describes complementary events?

(A) The first marble is red and the second marble is blue.

(B) The first marble is white and the second marble is white.

(C) The first marble is white and the second marble is red or blue.

(D) The first marble is white and the second marble is red or white.

(C) Complementary events in math are events that describe all the possible outcomes. For example, for flipping a coin, getting heads and getting tails are complementary events because they take care of all of the possible outcomes.

For this problem, then, (C) takes care of all the possible outcomes (selecting red, white or blue marbles.) The first marble is white and the second is red or blue – that takes care of all of the possible outcomes.

19. What is the value of m in the equation $3\frac{1}{4} \div 1\frac{1}{3} = m$?

(A) $2\frac{5}{12}$

(B) $2\frac{7}{16}$

(C) $3\frac{2}{7}$

(D) $4\frac{1}{3}$

(B) To divide fractions, you flip the second one and change it to multiplication. But if you've got mixed numbers you've got to change those to improper fractions first. Here's how it looks:

$$3\tfrac{1}{4} \div 1\tfrac{1}{3}$$

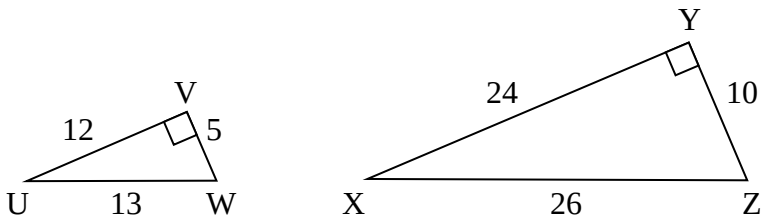
$$\tfrac{13}{4} \div \tfrac{4}{3}$$

$$\tfrac{13}{4} \times \tfrac{3}{4}$$

$$\tfrac{39}{16}$$

$$2\tfrac{7}{16}$$

20. Triangle UVW is similar to triangle XYZ.



What is the ratio of the length of one side of triangle UVW to the corresponding side of triangle XYZ?

(A) 1 to 2

(B) 1 to 3

(C) 2 to 1

(D) 3 to 1

(A) The important thing here is to choose what are called "corresponding" sides. How about the 13 from triangle UVW and the 26 from triangle XYZ? They're both the hypotenuses, so we're sure we're choosing corresponding sides. 13 to 26 can be reduced to 1 to 2.

21. In the equation $\frac{A}{27} = \frac{8}{24}$, what is the value of A?

(A) 3

(B) 9

(C) 18

(D) 30

(B) Use the proportion to cross multiply like this:

$$\frac{A}{27} = \frac{8}{24}$$

$$24A = 216$$

$$A = 9$$

You could also just reduce $\frac{8}{24}$ to $\frac{1}{3}$ and then see which of the answer choices, when put into A reduce to $\frac{1}{3}$

22. What is the slope of the line $5x - 8y = -16$?

(A) $\frac{5}{8}$

(B) $\frac{8}{5}$

(C) 5

(D) 8

(A) Manipulate the equation to turn it into slope-intercept form (y = mx + b) like this:

$$5x - 8y = -16$$

$$-8y = -5x - 16$$

$$y = \frac{5}{8}x + 2$$

So the slope is $\frac{5}{8}$

23. Jeffrey has 5 pairs of pants, 3 shirts and 5 hats. Only 1 pair of pants is red, 1 shirt is red and 1 hat is red. If he randomly selects an outfit to wear, what is the probability that all of the articles will be red?

(A) $\frac{1}{75}$

(B) $\frac{1}{25}$

(C) $\frac{1}{15}$

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

(A) To find the probability of multiple, independent (meaning they don't affect each other) events, find the probability of each and then multiply all the probabilities together.

Probability of red pants = $\frac{1}{5}$

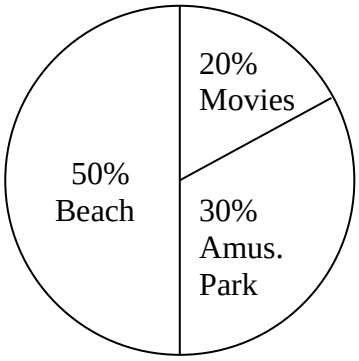
Probability of a red shirt = $\frac{1}{3}$

Probability of a red hat = $\frac{1}{5}$

Now multiply all the probabilities together:

$\frac{1}{5} \times \frac{1}{3} \times \frac{1}{5} = \frac{1}{75}$

24. Michelle asked her neighbors which summer activity they would rather do: go to the beach, go to an amusement park, or go to the movies. Her results are displayed in this circle graph.



Which set of preferences corresponds to Michelle's findings?

(A) 10 beach, 5 amusement park, 2 movies

(B) 10 beach, 6 amusement park, 4 movies

(C) 10 beach, 10 amusement park, 2 movies

(D) 10 beach, 10 amusement park, 8 movies

(B) This one is missing important information – how many neighbors Michelle asked. So we have to use the answer choices to help out.

Notice that all the answer choices have 10 neighbors saying they want to go to the beach, 50% of them said they want to go to the beach so Michelle must have asked 20 neighbors. That means amusement park + movies has to add to the other 10 and (B) is the only choice where that happens.

You could make sure by checking that 6 is 30% and 4 is 20% of 20.

25. The expression $\frac{b}{c}\left(\frac{c}{a}+\frac{b}{a}\right)$ is equal to which expression?

(A) $\frac{bc+2b}{ac}$

(B) $\frac{bc+b^2}{c}$

(C) $\frac{b}{a}\left(1+\frac{b}{c}\right)$

(D) $\frac{b}{a}\left(1+\frac{1}{c}\right)$

(C) To solve this, use the distributive property to simplify the expression in the problem:

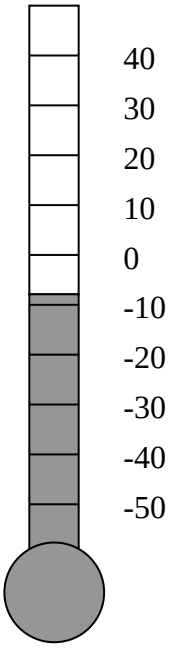
$$\frac{b}{c}\left(\frac{c}{a}+\frac{b}{a}\right)$$
$$\left(\frac{bc}{ac}+\frac{b^2}{ac}\right)$$
$$\left(\frac{bc+b^2}{ac}\right)$$

Now that is close to (B), but it's not it. It's not (A), so let's simplify C and see what we get:

$$\frac{b}{a}\left(1+\frac{b}{c}\right)$$
$$\frac{b}{a}+\frac{b^2}{ac}$$
$$\left(\frac{c}{c}\right)\left(\frac{b}{a}\right)+\frac{b^2}{ac}$$
$$\frac{bc}{ac}+\frac{b^2}{ac}$$
$$\frac{bc+b^2}{ac}$$

Good – I didn't want to have to do (D)…

26. A winter wilderness school won't let its students outside for recess until the temperature is at least 18^o F. The current temperature is given below (in ^oF).



By about how many degrees must the temperature rise in order for the school to let the students outside?

(A) -8^oF

(B) 10^o F

(C) 18^o F

(D) 26^o F

(D) Let's guestimate that the current temperature is -8 degrees. Okay, we have to get up to 18 degrees. So we want to know how many degrees are between -8 and 18. Two ways to do this. You can subtract: 18 – (-8) which will get you 26, or you can figure it's 8 degrees up to 0 degrees and then another 18 up to 18 gets you 26. Whichever way makes more sense to you.

27. Given the equation $y - 8 + 1 = x$, what is the value of $(y - x)$?

(A) -9

(B) -7

(C) 7

(D) 9

(C) Let's see if we can play with the equation to get y – x alone on one side:

$$y - 8 + 1 = x$$

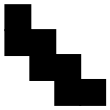
$$y - 7 = x$$

$$y = x + 7$$

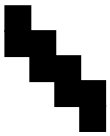
$$y - x = 7$$

28. The figures below show the first 5 elements of a pattern.

What is the next element of this pattern?

(A) 

(B) 

(C) 

(D) 

(B) If you look at the squares only (not the rectangles) there's a pattern. Under the right-most square, then to the right of it. Under the right-most square, then to the right of it. And so on.

So since the last square in the figure was placed under the right-most square, we need to place the next one under that one.

29. Out of the 64% of the seniors that got into Princeton, $\frac{3}{4}$ also got into Harvard as well. What fraction of the seniors got into both schools?

(A) $\frac{12}{50}$

(B) $\frac{12}{25}$

(C) $\frac{13}{25}$

(D) $\frac{24}{25}$

(B) So 3/4 of 64% of the students got into both schools. Now this is interesting – when we're talking fractions and percents, "of" actually means multiply. Sounds like divide, huh?

$$\frac{3}{4} \times 64\%$$

$$\frac{3}{4} \times \frac{64}{1}$$

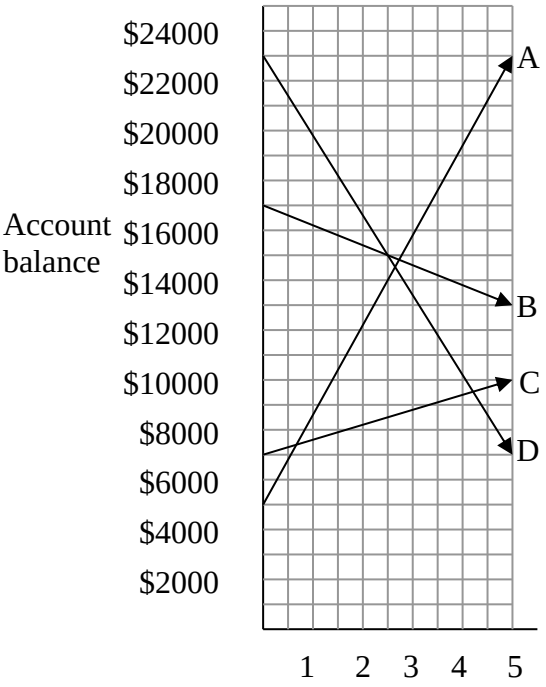
Cross reduce to get:

$$\frac{3}{1} \times \frac{16}{1}$$

That gets us 48%. Now let's turn that into a fraction:

$$\frac{48}{100} = \frac{24}{50} = \frac{12}{25}$$

30. The graph shows the average balance in 4 different savings accounts over a 5 day period.



Which account had the greatest daily decrease?

(A) Account A

(B) Account B

(C) Account C

(D) Account D

(D) Accounts A and C are increasing so we can eliminate those. Accounts B and D are decreasing but D is decreasing faster so it had the greatest daily decrease.

31. If Raul is $\frac{2}{5}$ of the way through singing a love song in 1 minute, how many minutes will it take to sing the rest of the song?

(A) 0.50

(B) 1.40

(C) 1.50

(D) 1.60

(C) One interesting way to do this one is to back up first. Like, if it took a minute to get 2/5 through the song, then he was 1/5 through the song in 30 seconds. The full song would be five 1/5's so that's 5 30 second's which is 2 1/2 minutes. Now, the question is how many minutes will it take to sing the rest of the song. Since he's already sung 1 minute, he's got another minute and a half to go. (C)

Now if that was too confusing you can use a proportion:

$$\frac{\frac{2}{5}\ of\ the\ song}{1\ minute} = \frac{\frac{5}{5}\ of\ the\ song}{x}$$

$$\frac{2}{5}x = (1)\left(\frac{5}{5}\right)$$

$$\frac{2}{5}x = 1$$

$$x = \frac{5}{2}\ or\ 2.5\ minutes$$

So it's 2.5 minutes for the whole song, subtract the minute he's already sung = 1.5 minutes left.

32. One spinner has six equally sized sections numbered 1 through 6 and another spinner has 3 equal-sized sections labeled A, B, and C. Jordan wants to use an outcome table to find the probability of spinning a factor of 12 on the numbered spinner. Which table is shaded in a way that will help Jordan find the answer?

SHADING

(A)

A1	A2	A3	A4	A5	A6
B1	B2	B3	B4	B5	B6
C1	C2	C3	C4	C5	C6

(C)

A1	A2	A3	A4	A5	A6
B1	B2	B3	B4	B5	B6
C1	C2	C3	C4	C5	C6

(B)

A1	A2	A3	A4	A5	A6
B1	B2	B3	B4	B5	B6
C1	C2	C3	C4	C5	C6

(D)

A1	A2	A3	A4	A5	A6
B1	B2	B3	B4	B5	B6
C1	C2	C3	C4	C5	C6

(B) Jordan is looking for the probability that he'll spin a factor of 12, so what are the factors of 12?

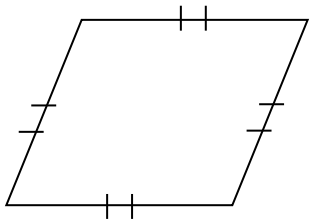
1 x 12 = 12

2 x 6 = 12

3 x 4 = 12

I like to list them in that order to make sure I got all of them. So the factors of 12 are 1, 2, 3, 4, 6, and 12. Since the number spinner only goes up to 6, we can ignore 12. And since they didn't mention that Jordan is paying any attention to the A, B, C letter spinner, we can just concentrate on the numbers. (B) is the only one that has 1, 2, 3, 4, and 6 shaded.

33. Use the figure below to answer the question.



Which type of quadrilateral is $ABCD$?

(A) rectangle

(B) rhombus

(C) square

(D) trapezoid

(B) You're kind of out of luck if you don't know the vocabulary for this one, but you can probably eliminate "rectangle" and "square." That leaves "rhombus" and "trapezoid." A rhombus is a parallelogram with 4 equal sides, which this is. By the way, a trapezoid is a quadrilateral with only one pair of parallel sides.

34. Which is equivalent to the following equation? $a = \frac{b}{3} + 7$

(A) $b - 7 = \frac{a}{3}$

(B) $3a - b = 7$

(C) $3(a - b) = 7$

(D) $\frac{1}{3}b = a - 7$

(D) Tricky problem. The equation in the question is solved for a so let's solve the answer choices for a:

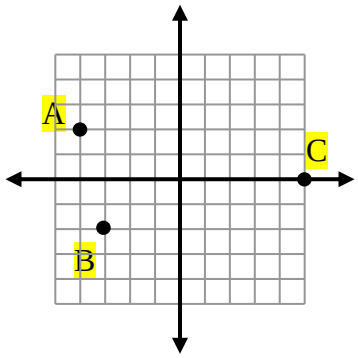
A.
$b - 7 = \frac{a}{3}$
$\frac{a}{3} = b - 7$
$a = 3b - 21$ ***NOPE***

B.
$3a - b = 7$
$3a = b + 7$
$a = \frac{b}{3} + \frac{7}{3}$ ***NOPE***

C.
$3(a - b) = 7$
$3a - 3b = 7$
$3a = 3b + 7$
$a = b + \frac{7}{3}$ ***NOPE***

D.
$\frac{1}{3}b = a - 7$
$a - 7 = \frac{1}{3}b$
$a = \frac{1}{3}b + 7$ ***YEP***

35. Robin is plotting a rectangle on the coordinate plane below.



Three of the vertices of the rectangle are the points A, B, and C. What are the coordinates of the fourth vertex of the rectangle?

(A) $(3,3)$

(B) $(3,4)$

(C) $(4,3)$

(D) $(4,4)$

(D) The thing to remember here is that rectangles are parallelograms which means that the opposite sides must be parallel, which in turn means that opposite sides must have the same slope.

Take the bottom left point. to get to the point on the right you have to go up 2 and to the right 8.

So, from the top left point, go up 2 and to the right 8. You'll find you'll end up at (4, 4)

36. What is the value of the expression $0.42 + 0.5 + 1.1 + 2.32$?

(A) 3.13

(B) 4.23

(C) 4.34

(D) 4.68

(C) The important thing here is to line up the decimal points:

$$\begin{array}{cccc} 0 & . & 4 & 2 \\ 0 & . & 5 & \\ 1 & . & 1 & \\ 2 & . & 3 & 2 \\ -- & -- & -- & -- \\ 4 & . & 3 & 4 \end{array}$$

37. The surface area of a cube is 294 in^2. What is the volume of the cube?

(A) 7 in^3

(B) 49 in^3

(C) 63 in^3

(D) 343 in^3

(D) First thing to notice here is that for a cube, all of the edges are the same length and all the faces have the same area. It's like a 3D square. So, since the faces all have the same area let's divide 294 by 6 to get the area of one face and we get 49.

Now each face is a square, so the length and width are the same – so they are both 7 (that's why the area of a face is 49.)

Now, the volume of a rectangular prism is V = lwh, but in our case it's a cube, so l and w and h are all the same: 7. So we multiply 7 x 7 x 7 to get the volume, which is 343.

38. Which expression is equivalent to this expression? $\frac{8\left(\sqrt{64}+32x\right)}{\sqrt{16}}$?

(A) $2\left(2+8x\right)$

(B) $2\left(8+32x\right)$

(C) $\frac{\sqrt{524}+32x}{\sqrt{16}}$

(D) $\frac{8\left(40x\right)}{\sqrt{16}}$

(B) Let's simplify the expression in the question:

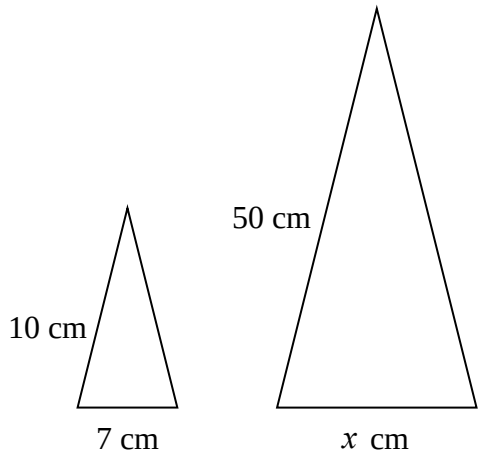
$$\frac{8\left(\sqrt{64}+32x\right)}{\sqrt{16}}$$

$$\frac{8(8+32x)}{4}$$

$$2(8+32x)$$

Make sure you stop there. If you distribute the 2, what you get won't look like any of the answers. This is a common trick in the ISEE – they'll stop before they've simplified fully.

39. The triangles below are similar.



What is the value of x?

(A) 17

(B) 35

(C) 49

(D) 70

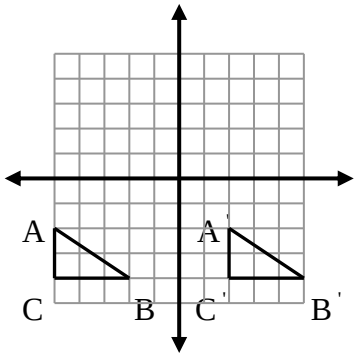
(B) Use proportions to solve problems involving similarity:

$$\frac{10\ cm}{7\ cm} = \frac{50\ cm}{x\ cm}$$

$$10x = 350$$

$$x = 35$$

40. Triangle ABC has been transformed to form the new triangle $A'B'C'$.



What type of transformation was performed?

(A) reflection

(B) rotation

(C) slide

(D) turn

(C) Here you just need to know the vocabulary:

reflection: like a mirror image

rotation: one point is fixed and everything rotates around that point

slide: figure looks the same, it's just in a different place

turn: same as a rotation

41. The Boiler brothers are going into business together making boilers. Getting started will cost them between $3,500 and $4,000. During their grand opening sale, they expect to sell 15 boilers every day for the first week (7 days). They sell each boiler for $300. If profit = revenues (sales) minus cost, then what is the expected profit after the first week of the grand opening sale?

(A) $13,000

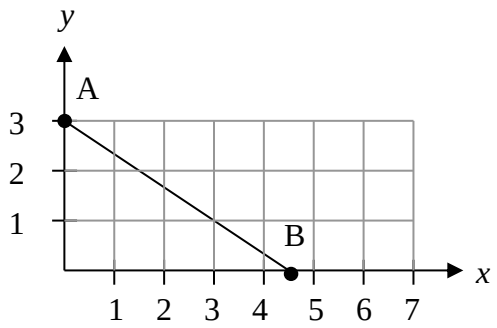
(B) $29,000

(C) $34,000

(D) $51,000

(B) Okay, they give us the formula to use:
Profit = revenues (sales) – cost
The cost is pretty simple-they say between $3500 and $4000. Looks like this is an estimation problem. Let's first plan for the worst-case scenario of $4,000 in costs.
So, 15 boilers at $300 each is $4500 per day. Times 7 days, that's $31,500. So:
Profit = $31,500-$4,000
Profit = $27,500
(B) is closest
Now, just to be doubly safe, let's test the same formula with an adjusted cost of $3500 (the best-case scenario for cost) to make sure we get the same answer in the end.
Profit = $31,500-$3,500
Profit = $28,000
(B) remains the closet

42. Line segment $\overline{AB}$ is shown in the graph.



What is the equation of the line perpendicular to $\overline{AB}$ at $(3,1)$?

(A) $y = -\frac{3}{2}x + \frac{7}{2}$

(B) $y = -\frac{3}{2}x - \frac{11}{2}$

(C) $y = \frac{3}{2}x - \frac{7}{2}$

(D) $y = \frac{3}{2}x + \frac{11}{2}$

(C) To start we need to know that perpendicular lines have opposite reciprocal slopes (like $\frac{2}{7}$ and $-\frac{7}{2}$). The line in the figure has a slope of $-\frac{2}{3}$ so the slope of the line we're looking for has a slope of $\frac{3}{2}$ which narrows our choices down to (C) and (D). Now use the point (3, 1):

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

$$y - 1 = \frac{3}{2}x - \frac{9}{2}$$

$$y = \frac{3}{2}x - \frac{7}{2}$$

43. What is the least common multiple of 9, 15, and 18?

(A) 3

(B) 9

(C) 90

(D) 2430

(C) Remember that "least common multiple" is the smallest number that all the numbers listed will divide into evenly. Careful not to confuse that with "greatest common factor" (which is the biggest number that will divide evenly into all the numbers listed – by the way (A) 3 is the greatest common factor of these numbers.)

It can be tough finding the LCM because the numbers can get pretty big so the best bet here is to test the answer choices. 15 and 18 won't go into 3 or 9 so we can eliminate (A) and (B). Let's test (C):

90 ÷ 9 = 10 good

90 ÷ 15 = 6 good

90 ÷ 18 = 5 good

44. A guitar is on sale for 25% off, and you have a coupon for 20% off the sale price. The original price of the guitar is $200. How much will you pay?

(A) $110

(B) $120

(C) $125

(D) $135

(B) Careful not to combine the percents into 45% - that doesn't work. You've got to do them one at a time (the phrase "20% off the sale price" tells you that.)

25% of $200 is $50 so the sale price is $200 - $50 or $150.

20% of $150 is $30 so you pay $150 - $30 or $120.

45. What is the value of x in the following equation: $\frac{x+4}{x} = \frac{7}{11}$?

(A) 11

(B) 4

(C) - 7

(D) - 11

(D) The ISEE loves proportions. Solve these by cross multiplying:

$$\frac{x+4}{x} = \frac{7}{11}$$
$$7x = 11x + 44$$
$$-4x = 44$$
$$x = -11$$

46. To dial long distance to Madagascar, your phone company charges you $3.00 for the first minute or fraction thereof, and $0.25 for each additional whole or fraction of a minute thereafter. Which equation represents the total charge, C, of talking to your friend in Madagascar for m minutes if m is a whole number of minutes?

(A) $C = 0.25m + 3m$

(B) $C = 0.25m - 3$

(C) $C = 0.25m + 3$

(D) $C = 0.25(m - 1) + 3$

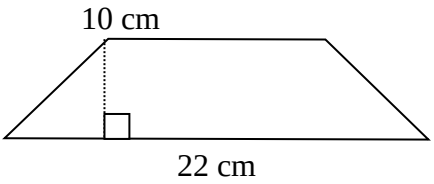
(D) The $3.00 charge is a one time charge for the first minute so we can eliminate (A). We can eliminate (B) because we don't want to subtract $3 from the charge (that's tricky because it's going to subtract $3 from our bank account eventually.) So we're down to (C) and (D). We don't want the $0.25 charge on the first minute though so we have to subtract one from the number of minutes. So that's "m – 1" which is in (D)

Another way to do this that you might like better is to figure out how much it would cost for some theoretical call, let's say 10 minutes:

$3.00 + nine $0.25's = $5.25

Then test the answer choices, substituting 10 in for m and see which one gets you the right charge: $5.25

47. Given that the formula for the area of a trapezoid is $\frac{1}{2}(b_1 + b_2)h$ what is the height, h, of the trapezoid below, if its area is 128 in^2?



(A) 4.0 in

(B) 8.0 in

(C) 9.5 in

(D) 12.8 in

(B) Let's use the formula they give us, plug in the values and solve for h.

$$A = \frac{1}{2}(b_1 + b_2)h$$

$$128 = \frac{1}{2}(22 + 10)h$$

$$128 = \frac{1}{2}(32)h$$

$$128 = 16h$$

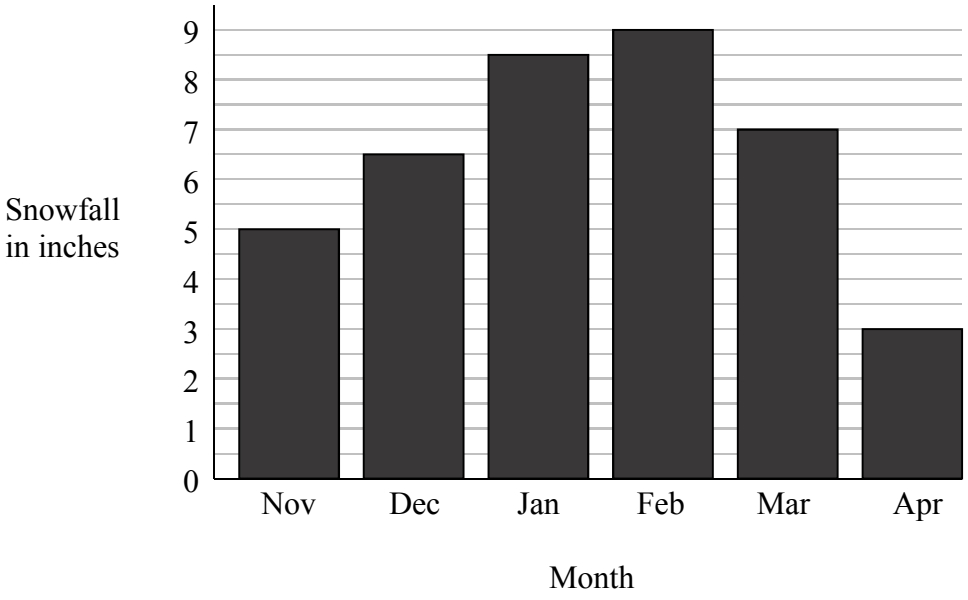
$$8 = h$$

Hayutin ISEE practice test – Middle Level QR answer key

Part One – Word Problems

Directions: Choose the best answer from the four choices given.

1. The graph shows the total snowfall for 6 months last year in Iceville:



According to the graph, what is the mean monthly snowfall?

(A) 6.5 in

(B) 7.0 in

(C) 8.5 in

(D) 9.0 in

(A) Since the "mean" is the "average" that means we add up the monthly snowfalls and then divide by 6 (since there are 6 of them:

$$5 + 6.5 + 8.5 + 9 + 7 + 3 = 39$$

then

$$39 \div 6 = 6.5$$

2. A set of 8 numbers has a mean of 10. What additional number should be included in this set to create a new set with a mean that is 4 less than the mean of the original set?

(A) –26

(B) –30

(C) –36

(D) –48

(A) Here's a little trick for tough "average" problems like this one. Use the formula ANT:

Average x Number = Total

Using the original situation (with 8 numbers and an average of 10):

8 x 10 = 80

Now, "What additional number" means we now have 9 numbers and "4 less" means our new average is 6 and finally our new total is the old one (80) plus the new number. So our new "ANT" is:

9 x 6 = 80 + n

54 = 80 + n

– 26 = n

3. Max has 15 coins, all of which are nickels and quarters. If his nickels were quarters and his quarters were nickels, his coins would total 60 cents more. How many quarters does Max have?
(Note: 1 nickel = $.05; 1 quarter = $.25)

(A) 4

(B) 5

(C) 6

(D) 10

(C) Don't get caught trying to create algebraic equations here. Test the answer choices – it's much quicker:

(A) 4(.25) + 11(.05) = 1.55

4(.05) + 11(.25) = 2.95

2.95 – 1.55 = 1.40 NOPE

(B) 5(.25) + 10(.05) = 1.75

5(.05) + 10(.25) = 2.75

2.75 – 1.75 = 1.00 NOPE

(C) 6(.25) + 9(.05) = 1.95

6(.05) + 9(.25) = 2.55

2.55 – 1.95 = 0.60 YEP

4. There are 8 same-sized cups filled with lemonade. John drank $\frac{1}{2}$ of every cup and Janice drank $\frac{1}{5}$ of every cup. About how much lemonade is left in total?

(A) 2 cups

(B) 2.5 cups

(C) 3 cups

(D) 3.5 cups

(B) John and Janice drank the same amount out of every cup so let's just look at one cup for now. Add the amount John and Janice drank:

1/2 + 1/5

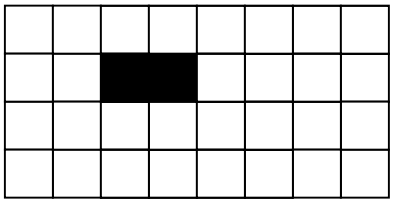
5/10 + 2/10 = 7/10

This means there was 3/10 left in each cup. Multiply that by the 8 cups:

8/1 x 3/10 = 24/10

24/10 = 12/5 = 2 2/5

5. The area of the entire rectangle shown is 160 in^2.



What is the area of the shaded region?

(A) 5 in^2

(B) 10 in^2

(C) 15 in^2

(D) 25 in^2

(B) There are 32 small squares in the figure so:

160 ÷ 32 = 5

So each of the small squares is 5 in^2. Since two of them are shaded that's 10 in^2.

6. Which number is closest to the square root of 120?

(A) 6

(B) 11

(C) 20

(D) 60

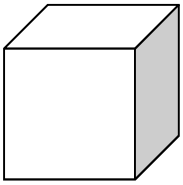
(B) Let's see here, the square root of 100 is 10 and the square root of 121 is 11, so 11.

7. The figures show two cubes whose volumes (V) are proportional.

Figure 1

$V = 27\,\text{in}^3$

Figure 2



$V = 64\,\text{in}^3$

What is the ratio of the side length of Figure 1 to the side length of Figure 2?

(A) 1 to 64

(B) 3 to 8

(C) 1 to 4

(D) 3 to 4

(D) These are "cubes" so that means the length, width and height are all equal. For the smaller cube, since V = lwh, that means each side is 3 since 3 x 3 x 3 = 27. For the larger cube each side is 4 since 4 x 4 x 4 = 64. So the ratio of the sides is 3 to 4

8. Jamie has created a form of currency to make trade with friends at the lunch table. The values are below.

2 pretzels = 3 chips
2 gummy bears = 1 pretzel

Jamie has 18 chips. How many gummy bears is that worth?

(A) 12

(B) 16

(C) 18

(D) 24

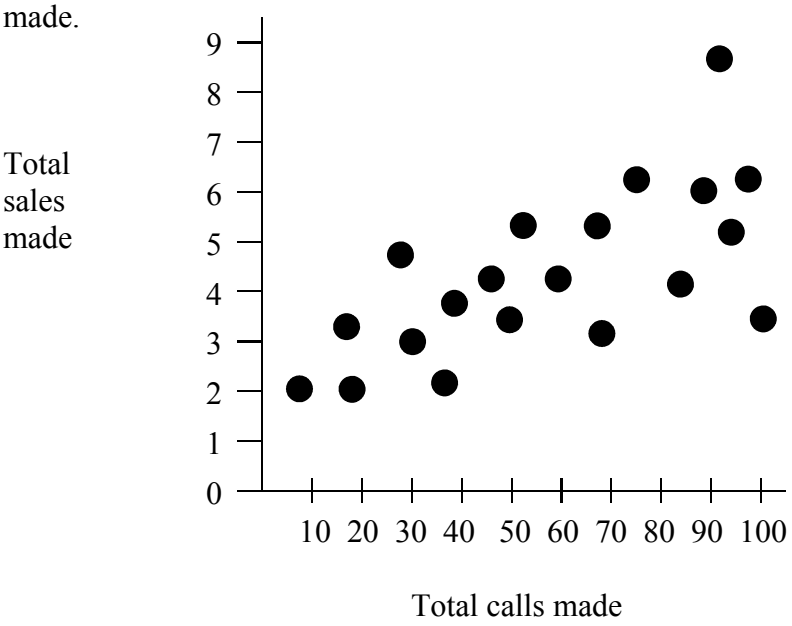
(D) Okay, we've got to turn chips into pretzels and then turn pretzels into gummy bears. Think of the table of values as ratios. So 2 pretzels to 3 chips. We can change that ratio by multiplying both the 2 and the 3 by the same number – let's just 6 (since that will give 18 chips) here's how it looks:

2 pretzels = 3 chips
x 6 x 6
12 pretzels = 18 chips

Cool, so Jamie's 18 chips are worth 12 pretzels. Now let's work with the other ratio:

2 gummy bears = 1 pretzel
x 12 x 12
24 gummy bears = 12 pretzels

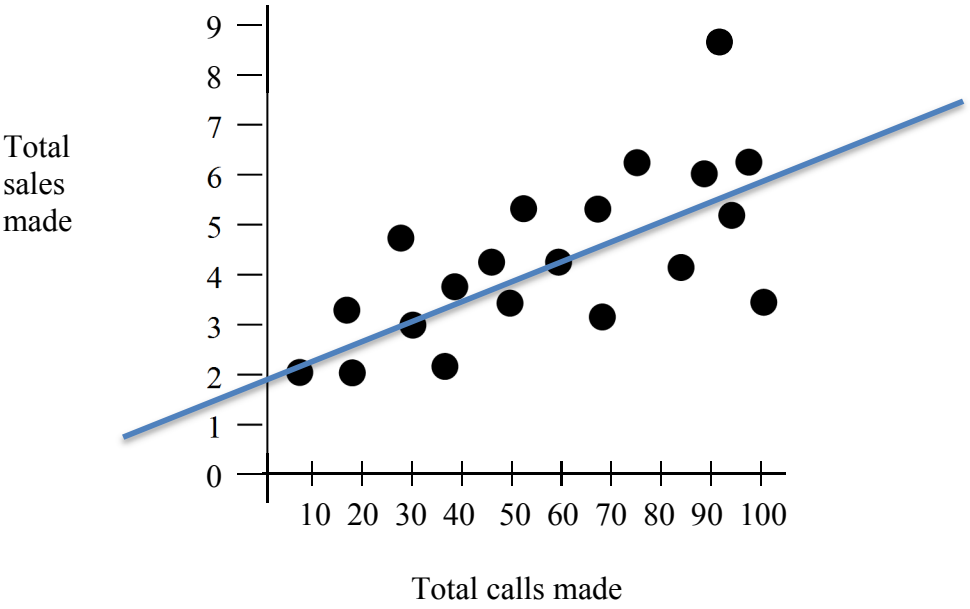
9. The graph shows the relationship between the number of calls made and the number of sales made.



According to the line of best fit, what was the average number of calls made per sale when 80 calls were made?

(A) 5.25
(B) 6.55
(C) 15.25
(D) 75.35

(A) The line of best fit is the line that goes through the middle of the data. It's drawn in the figure below. If you look at the line where 80 calls were made, it hits close to 5 total sales.



10. If $3x - 2 = 6$, then what must $6x - 4$ equal?

(A) 2

(B) 8

(C) 10

(D) 12

(D) There's a trick to this one. If you solve for x in the first equation, you get x = 8/3 which won't be very fun to plug in for the x in the other expression. Instead let's do this:

$$\mathbf{3x - 2 = 6}$$

$$\boldsymbol{\text{multiply both sides by } 2}$$

$$\mathbf{6x - 4 = 12}$$

And you're done. This is a popular type of problem on the ISEE and on other standardized tests like the ACT and the SAT.

11. A population of 56 bacteria has increased by 125%. What is the total number of bacteria after the increase?

(A) 68

(B) 70

(C) 126

(D) 140

(C) This is a nasty problem. Almost everyone will choose (B). But 70 is an increase of 25%. Here's the rule: to do a percent increase problem, add 1 to the decimal percent and then multiply. So if I were to increase 20 by 30%, I'd multiply by 1.30 – so to increase 56 by 125%, I'd have to multiply by 2.25 which equals 126. Tricky, huh? You can also take 125% of 56 and then add it to 56. Whichever makes more sense to you is fine.

12. Ben is using a computer program to randomly generate whole numbers from 1 to 10. What is the probability that the first two whole numbers the computer selects are both greater than 2?

(A) $\frac{1}{10}$

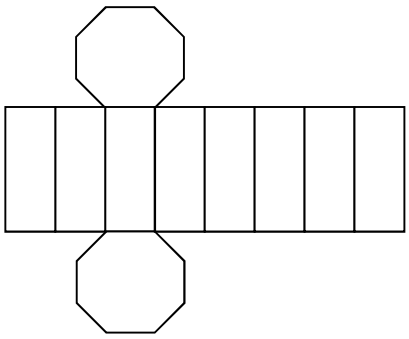
(B) $\frac{1}{5}$

(C) $\frac{1}{2}$

(D) $\frac{16}{25}$

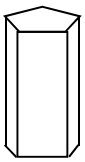
(D) Probability = # of items we want / total # of items. So here, the probability of getting a whole number greater than 2 is 8/10 since there are 8 numbers greater than 2 and 10 total numbers. Now, the number generator generates two numbers so we multiply the probabilities together (that's what you do to get the total probability.) So 8/10 times 8/10 gets you 64/100 which reduces down to 16/25

13. The following pattern can be folded into a polyhedron.

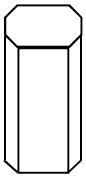


If the pattern were correctly folded, which polyhedron would result?

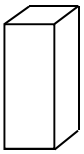
(A)



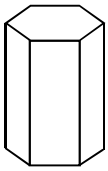
(C)



(B)



(D)



(C) This is pretty poorly drawn, but (C) is the right answer. According to the picture of the unfolded polyhedron in the question, the top of the polyhedron is an octagon (8 sides). (C) is the only choice that has an octagon on top.

14. A salesperson gets paid according to the following structure.

Number of Sales	Payment
1	$20
2	$40
3	$80

Molly, one of the salespeople, made $640. How many sales did she make?

(A) 6

(B) 8

(C) 16

(D) 64

(A) This is a pattern problem – we have to figure out the pattern. The payments are increasing so we're either adding a number each time or we're multiplying a number each time or a combination of the two. Let's look at adding. From $20 to $40 we added $20. From $40 to $80 we added $40 though so it doesn't look like adding is going to work. Let's try multiplying. From $20 to $40 we multiplied by 2. From $40 to $80 we multiplied by 2 also – boom. There's our pattern. So fill in the rest:

1 $20

2 $40

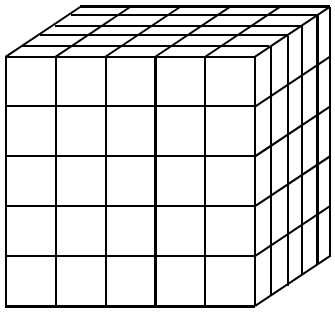
3 $80

4 $160

5 $320

6 $640

15. The following large cube is made of smaller cubes.



How many of the small cubes were needed to make the large cube?

(A) 40

(B) 60

(C) 125

(D) 150

(C) If you're hip to the volume formula V = lwh then you can use that. Since l = 5, w = 5 and h = 5, V = 5 x 5 x 5 = 125. If you forgot that formula or that doesn't quite work for you, try counting the number of small cubes on the front face – there are 25. Then the large cube is 5 deep so there are 5 25's = 125

16. The math club buys t-shirts for $16 each, with an additional 7.5% sales tax added per shirt. A standard shipping fee is also added to each order of t-shirts. The following table gives the total cost, including the shipping fee, of four separate orders.

T-SHIRT ORDERS

Number of T-Shirts	Total Cost of Each Order
1	$20.20
3	$54.60
4	$71.80
2	$37.40

How much is the shipping cost per order?

(A) $3.00

(B) $4.20

(C) $16.00

(D) $16.20

(A) Let's work with the easiest first – 1 shirt. It costs $20.20 to order 1 shirt, which is the $16 base price of the shirt + the 7.5% sales tax + the shipping fee. So, if we take away the $16 base price, that leaves us with $4.20. Now let's figure out the tax and then take that away. $16 x 0.075 = $1.20 so $4.20 - $1.20 leaves us with $3. That must be the tax. You can check your answer by trying the same process on the other orders if you want.

17. On Friday, Will told 4 people who he was going to ask to the dance. On Saturday, each of those 4 people told 4 different people who Will was going to ask to the dance. On Sunday, everyone who was told on Saturday told 4 different people. This pattern was repeated until the end of the day on Wednesday. Which expression represents the number of people who knew who Will was asking to the dance at the end of the day on Wednesday, including Will?

(A) $1+4^5$

(B) $1+4^6$

(C) $4+4^2+4^3+4^4+4^5+4^6$

(D) $1+4+4^2+4^3+4^4+4^5+4^6$

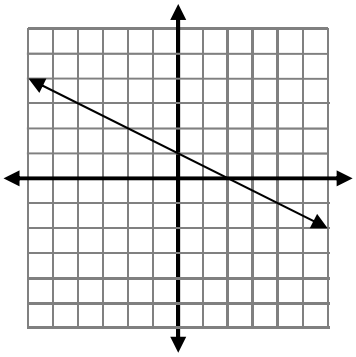
(D) This is a good problem for a chart:

Fri	*Sat*	*Sun*	*Mon*	*Tues*	*Wed*
4	*4 x 4 more*	*16 x 4 more*	*64 x 4 more*	*256 x 4 more*	*1024 x 4 more*

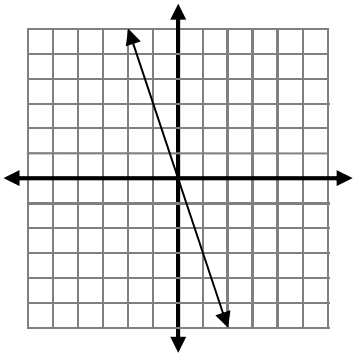
So it looks like 4 + 4(4) + 4(4)(4) + 4(4)(4)(4)… etc which looks like (C), but don't forget Will. They say how many people knew "including Will" so we need to add a 1. So that's (D)

18. For which function does the y value decrease at the greatest rate as the x value increases?

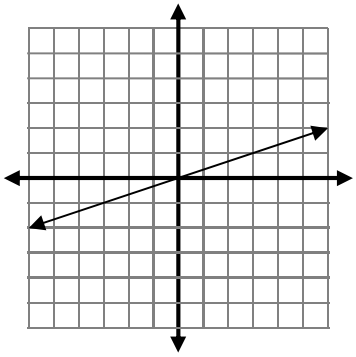
(A)



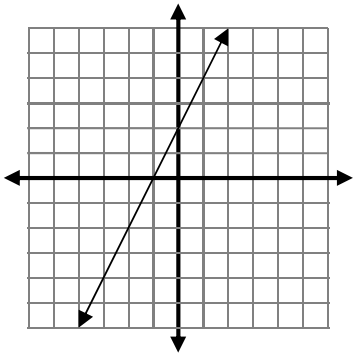
(B)



(C)



(D)



(B) First, translate "the y value decrease at the greatest rate" into "the line go down the fastest" and then translate "as the x value increases" into "as you move right to left." So, in our new question is, "For which function does the line go down the fastest as you move right to left?" That's easy - (B)

19. Kenny and Brett are running on a straight trail, starting at the same place and time. Kenny runs 4 times as fast as Brett (Brett's speed is given by B). After 45 minutes, they are 500 feet apart. Which equation, when solved for B, will give Brett's speed, in feet per minute?

(A) $4B - B = 500$

(B) $180B - 500 = 45B$

(C) $45B = 500 - 180B$

(D) $45(B + 4B) = 500$

(B) The key here is what I like to call DERT, or "distance equals rate times time."

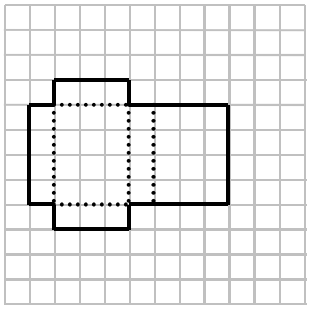
Kenny:	***Brett:***
D E R T	***D E R T***
D = 4B times 45	***D = B times 45***
D = 180B	***D = 45B***

Now, since they're 500 feet apart, Kenny should be 500 feet ahead of Brett because he's running faster. Kenny's distance minus Brett's distance should be 500:
180B – 45B = 500

Bummer, none of the answer choices look like that. But doing some Algebra we can get it to look like (B)

180B – 45B = 500
+45B +45B
180B = 500 + 45B
-500 -500
180B – 500 = 45B

20. The figure below is a two-dimensional representation of a three-dimensional object. When cut out and folded along the dotted lines, a three dimensional object is created.



(each small square is 1 in. × 1 in.)

What is the volume of the three-dimensional object?

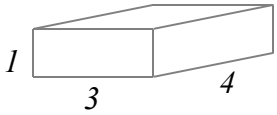
(A) 9 in^3

(B) 12 in^3

(C) 27 in^3

(D) 108 in^3

(B) This is what the box will look like:



Since V = lwh, V = (4)(3)(1) which equals 12

Part Two – Quantitative Comparisons

Directions: Using the information given in each question, compare the quantity in Column A to the quantity in Column B. All questions in Part Two have these answer choices:

(A) The quantity in Column A is greater.
(B) The quantity in Column B is greater.
(C) The two quantities are equal.
(D) The relationship cannot be determined from the information given.

$y = 5x - 3$

	Column A	Column B
21.	The value of x when $y = 22$	The value of y when $x = 5$

The answer is (B) because…

Column A:

$y = 5x - 3$

$22 = 5x - 3$

$25 = 5x$

$5 = x$

Column B:

$y = 5x - 3$

$y = 5(5) - 3$

$y = 25 - 3$

$y = 22$

Beth has $1.72 in quarters, nickels and pennies only.
(Note: 1 quarter = $.25; 1 nickel = $.05; 1 penny = $.01)

	Column A	Column B
22.	The smallest number of coins that Beth could have received.	11

The answer is (A) because…

Column A:

The smallest number, so let's start with quarters. Since they're the biggest, we'll use the least. 25, 50, 75, 1.00, 1.25, 1.50… so that's 6 quarters. They tell us not to use dimes so we skip to nickels next: 1.55, 1.60, 1.65, 1.70… so that's 4 nickels (and 10 total coins so far). 2 pennies gets us to $1.72 so that's 12 coins.

	Column A	Column B
23.	$\sqrt{36+64}$	$\sqrt{36}+\sqrt{64}$

The answer is (B) because…

Column A:

$\sqrt{36+64} = \sqrt{100} = 10$

Column B:

$\sqrt{36}+\sqrt{64} = 6+8 = 14$

	Column A	Column B
24.	-4^4	$(-4)^4$

The answer is (B) because…

Column A:

This is NOT "negative 4 to the 4th power." It's "the opposite of 4 to the 4th power." So, since 4 to the 4th power is 256, column A is -256.

Column B:

This IS "negative 4 to the 4th power" which is (-4)(-4)(-4)(-4) which is 256

The original price of a skateboard was $50.00.

	Column A	Column B
25.	The amount saved after a 30% discount	The amount saved after two separate 15% discounts

The answer is (A) because…

Column A:

30% of 50 is $15 (because .30 times 50 is 15) so you save $15

Column B:

15% of 50 is $7.50 (because .15 times 50 is 7.5) so the price falls to $42.50. Now we take 15% of 42.50 which is 6.375. So you saved $7.50 + $6.375 = $13.875

If you're wondering what the heck is going on, the reason (B) is smaller is because when you take the second 15% you're taking 15% of a smaller number so you save less.

To get to work, John can take the highway for 30 miles at an average speed of 60 miles per hour, or he can take a side street for 20 miles at an average speed of 40 miles per hour.

	Column A	Column B
26.	Average time the highway route takes	Average time the side street route takes

The answer is (C) because…

Column A:

60 miles per hour means 60 miles in one hour. So if he's traveling half that distance it will take him half that time, or a half hour (or 30 minutes).

Column B:

40 miles per hour means 40 miles in one hour. So if he's traveling half that distance it will take him half that time, or a half hour (or 30 minutes).

	Column A	Column B
27.	The slope of $9x - 3y = 15$	The slope of the line that passes through (3,3) & (0,12)

The answer is (A) because…

Column A:

Let's convert this to slope-intercept form.

$$9x - 3y = 15$$

$$-3y = -9x + 15$$

$$y = 3x + 15$$

So the slope is 3.

Column B:

Let's use the slope formula:

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{12-3}{0-3} = \frac{9}{-3} = -3$$

To see how two groups of people feel about Coke vs. Pepsi, samples of each group were interviewed to see which they like better. The percent of each sample interviewed and their preference are shown in the table.

GROUP	A	B
Percent of Group Interviewed	50%	25%
Number of people who prefer Coke	35	19
Number of people who prefer Pepsi	15	6

The results above can be used to predict how many people prefer Coke or Pepsi when everyone is interviewed.

	Column A	Column B
28.	The predicted number of people who prefer Coke when everyone is interviewed in Group A	The predicted number of people who prefer Coke when everyone is interviewed in Group B

The answer is (B) because…

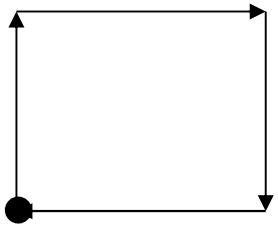
Column A:

50% have been interviewed, which means that half of the people have been interviewed. Since the question says, "The results above can be used to predict…" we can assume that the second half will be just like the first. Since 35 people in the first half preferred Coke, 35 of the second half will as well totaling 70 people who prefer Coke.

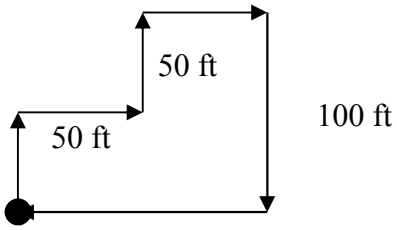
Column B:

25% have been interviewed, or ¼. That means there's another ¾ to be interviewed, or, to put it another way, 3 more 25% groups. That's helpful here, because we can just multiply the 19 who preferred Coke in the first 25% by 3 to get the remaining 75%. 19 x 3 = 57. We add that 57 to the 19 from the first group and we get 76 people who prefer Coke.

Vanessa's Normal Route



Vanessa's Shortcut



In the diagrams above, all of the angles that look like right angles are right angles.

	Column A	Column B
29.	The distance Vanessa saved by taking the shortcut instead of her normal route	100 ft

The answer is (B) because…

Column A:

Vanessa didn't actually save any distance. Her normal route is 100 + 100 + 100 + 100 = 400. Her shortcut is 50 + 50 + 50 + 50 + 100 + 100 = 400. So column A's value is 0.

Column B:

This is 100

Phil is biking from point A to Point E. He must travel through points B, C, and D (in that order) to reach point E. Phil has just arrived at point C.

DISTANCE BETWEEN POINTS

Point A to Point B	9 miles
Point B to Point C	4 miles
Point C to Point D	8 miles
Point D to Point E	6 miles

	Column A	Column B
30.	The total number of miles Phil has already ridden.	The total number of miles Phil has left to ride.

The answer is (B) because…

Column A:

Since Phil just arrived at point C, he has ridden 9 + 4 = 13 miles.

Column B:

Since Phil just arrived at point C, he still has 8 + 6 = 14 miles left to ride.

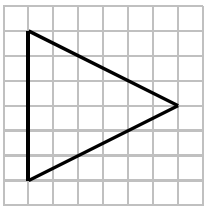


Figure A

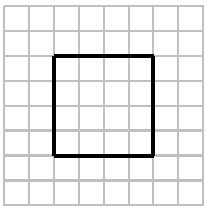


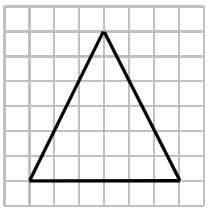
Figure B

	Column A	Column B
31.	Area of figure A	Area of Figure B

The answer is (A) because…

Column A:

The area of a triangle is A = ½ bh, but with this figure the base is the side on the left and the height is the horizontal line through the middle. Here – I'll turn it right side up:



So A = ½ bh

A = ½ (6)(6)

A = 18

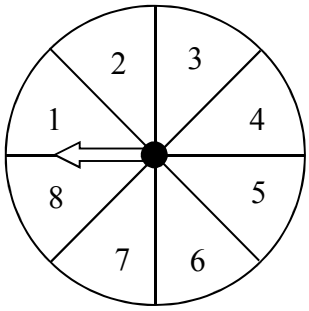
Column B:

The area of a square is just like the area of a rectangle A = lw.

So A = (4)(4)

A = 16

The spinner has been divided into 8 equal parts.



	Column A	Column B
32.	The probability of spinning an even number	The probability of spinning a number less than 5

The answer is (C) because…

Column A:

Probability is # successful / total #, so since there are 4 even numbers the probability of spinning an even number is 4/8 or 1/2

Column B:

Again, probability is # successful / total #, so since there are 4 numbers less than 5 the probability of spinning a number less than 5 is 4/8 or 1/2

Eleven pieces of paper numbered $0-10$ are placed into a bowl and one is selected without looking.

	Column A	Column B
33.	Probability of choosing an even number	Probability of choosing an odd number

The answer is (A) because…

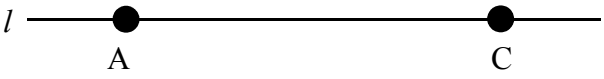
Column A:

Probability is # successful / total #, so since there are 6 even numbers (0, 2, 4, 6, 8, 10) the probability of selecting an even number is 6/11 (since there are 11 total numbers – 1 through 10 and zero)

Column B:

Again, probability is # successful / total #, so since there are 5 odd numbers (1, 3, 5, 7, 9) the probability of selecting an odd number is 5/11

A and C are points on line l. Point B (not shown) is on the line between A and C.



	Column A	Column B
34.	The distance between A & B	The distance between B & C

The answer is (D) because you don't know if point B is closer to point A or point C or if it's equidistant.

	Column A	Column B
35.	$\sqrt{0.64}$	$\sqrt{6.4}$

The answer is (B) because the quantity 6.4 is larger than 0.64. If you're not sure, test a few numbers.

$\sqrt{25} = 5 \quad \sqrt{36} = 6$

See? If you have a larger number inside the square root sign, you'll get a larger square root.

A box at the grocery store has 5 yellow peppers, 4 red peppers and 3 red peppers. You pick a pepper out without looking.

	Column A	Column B
36.	Probability that you pick a yellow pepper	Probability that you don't pick a yellow pepper

The answer is (B) because…

Column A:

Probability is # successful / total #, so since there are 5 yellow peppers and 12 total peppers the probability of selecting a yellow pepper is 5/12

Column B:

Again, probability is # successful / total #, so since there are 7 peppers that are not yellow the probability of selecting a pepper that isn't yellow is 7/12

$$\frac{x}{3} - 12 = 20$$

$$6y + 24 = 84$$

	Column A	Column B
37.	x	y

The answer is (A) because…

Column A:

x/3 – 12 = 20

x/3 = 32

x = 96

Column B:

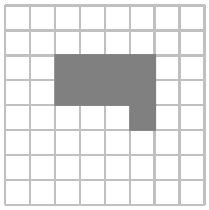
6y + 24 = 84

6y = 60

y = 10

Hayutin ISEE practice test – Upper Level MA answer key

1. The area of each small square on the grid shown is 4 cm^2.



What is the area of the shaded region?

(A) 36 in^2

(B) 40 in^2

(C) 44 in^2

(D) 48 in^2

(A) You can just count the squares that are shaded and multiply by 4. There are 9 shaded squares so that's 36.

2. A bag contains 9 black pens, 5 blue pens, and 3 red pens. If one pen is chosen at random and then returned to the bag, and a second pen is chosen at random, what is the probability that both pens will be red?

(A) $\frac{1}{3}$

(B) $\frac{3}{17}$

(C) $\frac{1}{3} \times \frac{1}{3}$

(D) $\frac{3}{17} \times \frac{3}{17}$

(D) Probability is:

$$\frac{\text{\# of ones we want}}{\text{total \# of items}}$$

So the probability that a pen will be red (let's just start with one pen for now) is $\frac{3}{17}$***. Then, to find the probability of 2 separate events, multiply the two together. Since we replace the red pen after we choose it the first time, there are still 3 red pens and still 17 total pens so the probability is still*** $\frac{3}{17}$***. So*** $\frac{3}{17}$ ***times*** $\frac{3}{17}$ ***is our answer.***

3. What is the value of the numerical expression $6.7 \times 10^8 + 2.2 \times 10^6$?

(A) 2.267×10^6

(B) 6.92×10^7

(C) 6.722×10^8

(D) 8.9×10^{14}

(C) We're going to have to change the scientific notation to standard form like this:

6	*7*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
+		*2*	*2*	*0*	*0*	*0*	*0*	*0*
6	*7*	*2*	*2*	*0*	*0*	*0*	*0*	*0*

And then change the result back to scientific notation, which is $\mathbf{6.722\ x\ 10^8}$

4. Which value is not equal to $\frac{1}{3}$?

(A) 0.3333333

(B) $0.\overline{3}$

(C) $\frac{0.5}{1.5}$

(D) $\frac{1.2}{3.6}$

(A) 1/3 is equal to 0.3 repeating. "Repeating" is the key word. The 3's go on forever. See how in (A) they go pretty far, but then they stop? If (A) had been 0.3333333… (with the three dots at the end) then it would have been correct. The dots at the end mean the 3's go on forever. Here's why the other ones are ok:

For (B) the bar over the 3 means the 3's go on forever.

For (C) if you multiply the top and bottom by 10 you get 5/15 which then reduces to 1/3

For (D) same thing – if you multiply the top and the bottom by 10 you get 12/36 which also reduces to 1/3

By the way, multiplying the top and bottom by 10 is legal because it's like multiplying by 10/10 and 10/10 is equal to 1. When you multiply things by 1 they stay the same – so you haven't changed the value of the fraction, just the form.

5. If $(4.15 + 0.85)n = n$, then what is the value of n?

(A) 5

(B) 1

(C) $\frac{1}{5}$

(D) 0

(D) Okay, let's solve this equation:

$$(4.15 + 0.85)n = n$$
$$(5)n = n$$
$$5n = n$$
$$4n = 0$$
$$n = 0$$

This is a pretty strange equation – you've probably never seen one quite like it before. But we followed all the algebra rules and got n alone on one side so 0 must be the answer.

6. For what value of x is the equation $\frac{x+3}{3+x} = 0$ true?

(A) -3

(B) 0

(C) all real numbers

(D) There is no value of x that would make the equation true

(D) Another strange equation. A couple things you have to know here. First, when you have a variable in the denominator of a fraction you have to find out when the denominator will be 0 and then those values are off limits. So let's see when our denominator will be zero:

$$3 + x = 0$$
$$x = -3$$

Okay, so –3 is off limits – we can't have our x be –3.

The next thing to know here is to make a fraction 0 (like the equation says) the numerator has to be zero. So let's see when it's zero:

$$x + 3 = 0$$
$$x = -3$$

But remember – our x can't be –3 so alas, there is no solution. Bummer.

7. What is the value of the numerical expression $\sqrt{81+144}$?

(A) 3

(B) 15

(C) 21

(D) 108

(B) The first thing to know here is that you can't split this into two radicals like this:

$$\sqrt{81}+\sqrt{144}$$ ***no, no, no, no, NO!***

So you have to add inside of the radical and then take the square root:

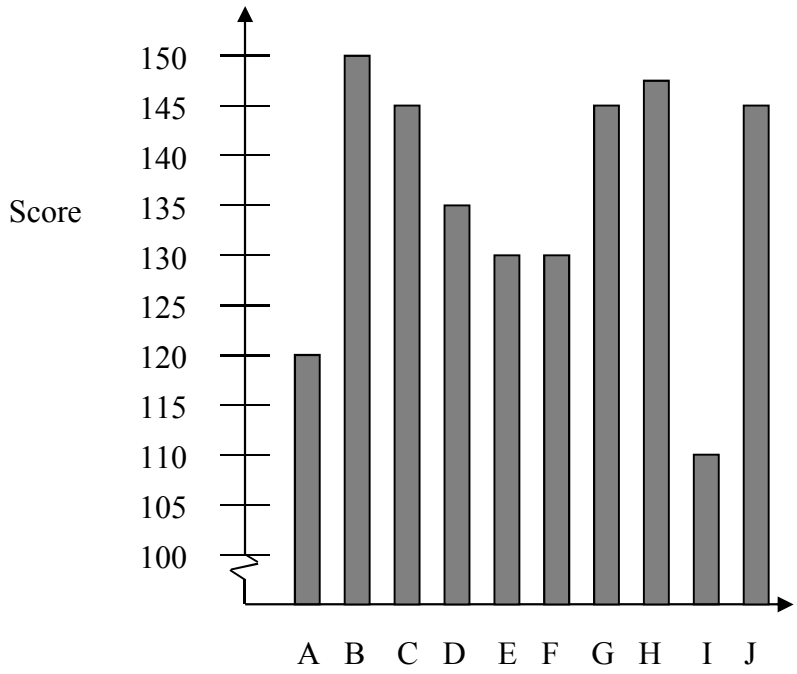
$$\sqrt{81}+\sqrt{144}$$

$$\sqrt{225}$$

$$15$$

Hopefully you know that $\sqrt{225}$ = 15, but if not, you can just test the answers. For (A) 3 x 3 = 9. For (B) 15 x 15 = 225.

8. The bar graph shown represents the IQ scores of 10 different people.



Each letter represents one person

What is the median score?

(A) 130

(B) 137

(C) 140

(D) 155

(C) Okay, the median is the number in the middle when the scores are put in order from lowest to highest (actually, you could put them in order from highest to lowest too, but that would be giving yourself more work than is necessary). So first lets list all the scores, then we'll put them in order:

120, 150, 145, 135, 130, 130, 145, 147, 110, 145

Okay, now putting them in order:

110, 120, 130, 130, 135, 145, 145, 145, 147, 150

Now, there are 10 numbers so there is no middle number. What you do then is you take the average of the two numbers that share the middle. In this case it's 135 and 145. The average of those two numbers is 140.

9. Tim and Doug are laying brick on a wall. Tim makes 2 times as many errors as Doug does. When the wall is finished there are 12 errors. How many errors did Doug make?

(A) 2

(B) 4

(C) 6

(D) 8

(B) Two ways to do this. With algebra:

let t = # of errors Tim makes

let d = # of errors Doug makes

So:

$t = 2d$

$t + d = 12$

Now substituting the first equation into the second:

$2d + d = 12$

$3d = 12$

$d = 4$

The other way is to just guess and check. Just make sure Tim makes 2 times as many errors as Doug and guess until you get 12 total errors.

Tim errors	*Doug errors*	*Total errors*
4	*2*	*6*
6	*3*	*9*
8	*4*	*12*

10. Tom has taken three tests so far in his Physics class. His scores on these tests were 90, 86, and 92. The score on his final exam will be counted twice in his mean. What is the lowest score he can get on his final exam and have a mean score of no less than 90?

(A) 90

(B) 91

(C) 92

(D) 93

(B) Tricky. There's almost always a problem like this on the test. Let's form an equation:

$$\frac{90+86+92+x+x}{5} = 90$$

We put 2 x's because it told us that the final exam would be counted twice. Now solve:

$$\frac{90+86+92+x+x}{5} = 90$$

$$90 + 86 + 92 + x + x = 450$$

$$268 + 2x = 450$$

$$2x = 182$$

$$x = 91$$

11. Ellen recorded the number of siblings each student in her class has in the table shown.

SIBLINGS

Number of Siblings	Number of Students That Have That Many Siblings
0	7
1	6
2	5
3	3
4	3

What is the mode of the data?

(A) 0

(B) 3

(C) 4

(D) 7

(A) The mode is the number that shows up the most. Now the tricky thing is that the chart doesn't list the data – you have to. The data looks like this:

0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 3, 3, 3, 4, 4, 4

You can see that there are 7 0's so 0 is the mode.

12. If a and b are prime numbers, what is the least common multiple of $6a^2$, $8a$, and $9ab$?

(A) $9ab$

(B) $9a^2b$

(C) $72ab$

(D) $72a^2b$

(D) This one involves the prime factorization method of finding the least common multiple. It's a little tricky to explain. Here it goes: Find the prime factorization of each number:

$$6a^2 = 2 \times 3 \times a \times a$$

$$8a = 2 \times 2 \times 2 \times a$$

$$9ab = 3 \times 3 \times a \times b$$

Now take the HIGHEST number of each factor:

2: there are three 2's in 8a

3: there are two 3's in 9ab

a: there are two a's in $6a^2$

b: there is one b in 9ab

So our LCM is:

$$2 \times 2 \times 2 \times 3 \times 3 \times a \times a \times b$$

Which is:

$$72a^2b$$

13. If $5y - 10 = xy - 2x$ and $y \neq 2$, what is the value of x?

(A) -5

(B) -1

(C) 1

(D) 5

(D) Kind of a weird equation. Let's see if we can be creative with our Algebra rules:

$$5y - 10 = xy - 2x$$

(I'm just going to swap sides so I get the x's on the left)

$$xy - 2x = 5y - 10$$

$$x(y - 2) = 5y - 10$$

$$x = \frac{5y-1\ 0}{y-2}$$

$$x = \frac{5(y-2)}{y-2}$$

$$x = 5$$

14. Which expression is equivalent to the expression $5x^3y^4 + 2x^4y^3 - \left(3x^4y^3 - 6x^3y^4\right)$?

(A) $11x^3y^4$
(B) $-x^3y^4$
(C) $11x^3y^4 - x^4y^3$
(D) $2x^3y^4 + 8x^4y^3$

(C) Okay, let's simplify:

$$5x^3y^4 + 2x^4y^3 - (3x^4y^3 - 6x^3y^4)$$
$$5x^3y^4 + 2x^4y^3 - 3x^4y^3 + 6x^3y^4$$
$$11x^3y^4 - x^4y^3$$

It's a little tricky with all the 3's and 4's as the exponents. Just take your time and be careful.

15. For what value(s) of x does $\dfrac{x^2 - 16}{(x+1)(x-3)} = 0$?

(A) $x = 4$ only
(B) $x = -1$ and $x = 3$
(C) $x = -4$ and $x = 4$
(D) $x = -1$, $x = 3$, $x = -4$, and $x = 4$

(C) Okay, first we need to deal with the variables in the denominator. Remember – we can't have the denominator be 0 so, let's figure out what will make the denominator 0 so we know those values are off limits for x. –1 and 3 will make the denominator 0 so those two values are off limits for x.

Next, the way to have a fraction equal 0 is to have the numerator equal 0. So:

$$x^2 - 16 = 0$$
$$x^2 = 16$$
$$x = \pm 4$$

Or you could solve it like this:

$$x^2 - 16 = 0$$
$$(x + 4)(x - 4) = 0$$
$$x = 4, x = -4$$

16. Which expression is equivalent to the expression $(x-3)(x+5)$?

(A) x^2-15

(B) x^2+2

(C) $x^2-2x-15$

(D) $x^2+2x-15$

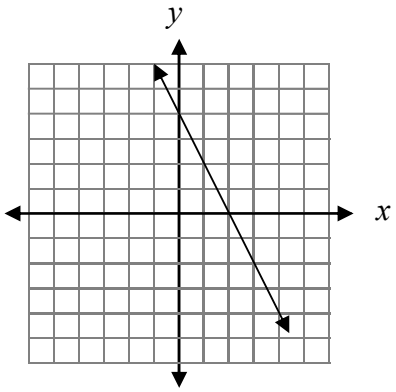
(D) You just have to FOIL this:

$(x-3)(x+5)$

$x^2+5x-3x-15$

$x^2+2x-15$

17. The graph of a line is shown.



What is the slope of the line?

(A) –3

(B) –2

(C) 2

(D) 3

(B) When they show you a graph of a line, just pick a point to start at and then move straight up and down and right and left to get to another point. If you start at the y-intercept and go to the x-intercept, you'll go down 4 and right 2. Remember that up is positive, down is negative, right is positive and left is negative. So down 4 and right 2 is:

$\frac{-4}{2} = -2$

18. Point $(2,5)$ is on a circle with center $(-1,1)$. What is the radius of the circle?

(A) 3 grid units

(B) 4 grid units

(C) 5 grid units

(D) 6 grid units

(C) Think of the definition of a radius. It's the distance between the center of a circle to any point on the circle. So the distance between those two points is the radius. Remember the distance formula?

$$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$D = \sqrt{(-1 - 2)^2 + (5 - 1)^2}$$

$$D = \sqrt{(-3)^2 + (4)^2}$$

$$D = \sqrt{9 + 16}$$

$$D = \sqrt{25}$$

$$D = 5$$

19. Sheri is planning a survey to try and determine the average number of hours people in her neighborhood spend reading books. Which sample will give her the most reliable information about the people in her neighborhood?

(A) her friends

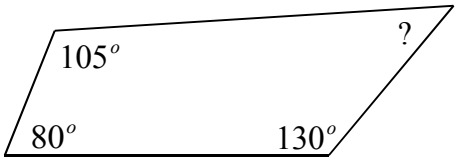
(B) a random sample of all the people in her neighborhood

(C) all of the people that show up to her dinner party

(D) a random sample of the people walking their dogs in the morning

(B) The question asks for "reliable" information and in statistics reliable information comes from random samples. You want to select your participants for an experiment or study in as random a way as possible. Otherwise, you'll end up with biased info.

20. The measures of three angles of a quadrilateral are shown in the diagram.



What is the measure of the fourth angle?

(A) 45^o

(B) 55^o

(C) 65^o

(D) 75^o

(A) The angles of quadrilaterals add up to 360^o so we can set up and solve the following equation:

$$105 + 80 + 130 + x = 360$$

$$315 + x = 360$$

$$x = 45$$

21. The 6 representatives of the student government plan to send 3 representatives to a conference. How many combinations of 3 representatives are possible from the 6 representatives?

(A) 6

(B) 15

(C) 18

(D) 20

(D) Here are the formulas for these:

If the order doesn't matter (in other words, AB and BA are the same and are counted as 1 rather than 2 possibilities) then here's the formula:

$$\frac{(total\ number)!}{(\#\ in\ group)!\,(total\ \#-\#\ in\ group)!}$$

If the order does matter (in other words, AB and BA are not the same and are counted as 2 possibilities rather than 1) then here's the formula:

$$\frac{(total\ number)!}{(total\ \#-\#\ in\ group)!}$$

Now, since the order doesn't matter (Jeff, Jane and Joe is the same as Joe, Jane and Jeff) we'll use the first formula:

$$\frac{6!}{3!\,3!}$$

This simplifies to:

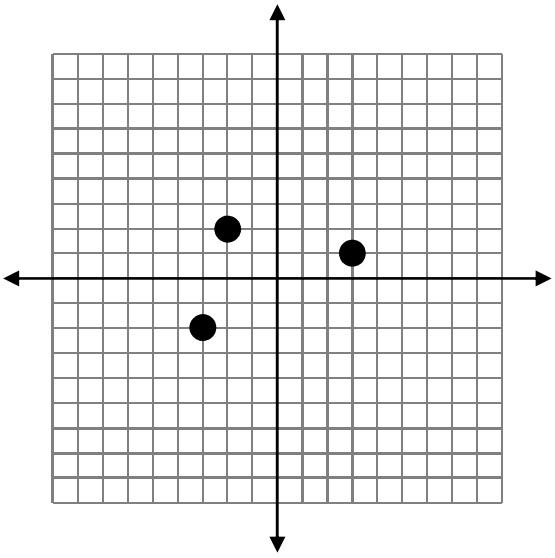
$$\frac{6\times5\times4\times3\times2\times1}{3\times2\times1\times3\times2\times1}$$

$$\frac{6\times5\times4}{3\times2\times1}$$

$$5\times4$$

$$20$$

22. The grid shows three vertices of a parallelogram.



Which could be the coordinates of the fourth vertex of the parallelogram?

(A) $(-8,-1)$
(B) $(0,-3)$
(C) $(3,-1)$
(D) $(4,-4)$

(A) This one is tricky. We know that parallelograms have opposite sides that are parallel which means the opposite sides will have the same slope.

Let's start with the top left point (-2, -2). To get to the point on the right we go down 1 and right 5. Let's do that same move with the bottom left point (-3, -2). Moving down 1 and right 5 gets us to (2, -3) but that's not one of the choices. Doah!

Okay, let's start with the point all the way to the right (3, 1) to get to the top left point we go up 1 and left 5. Let's do that same move with the bottom left point (-3, -2). Moving up 1 and left 5 gets us to (-8, -1). Perfect! This is a weird, super skinny parallelogram, but put the point on the graph above and check it out – it definitely is a parallelogram.

23. Which describes all values of x for which $|4x-9| \geq 11$?

(A) $x \geq 5$

(B) $x \leq \frac{1}{2}$

(C) $x \geq \frac{1}{2}$ or $x \leq -5$

(D) $x \leq -\frac{1}{2}$ or $x \geq 5$

(D) For absolute value inequalities you create two separate inequalities:

$$4x - 9 \geq 11 \qquad 4x - 9 \leq -11$$

$$4x \geq 20 \qquad 4x \leq -2$$

$$x \geq 5 \qquad x \leq -\frac{1}{2}$$

24. What type of number could NOT result from the sum of two irrational numbers?

(A) integer

(B) rational number

(C) complex number

(D) irrational number

(C) Tricky. Looking through the answers I see that (D) is correct because:

$$\sqrt{5} + \sqrt{5} = 2\sqrt{5}$$

I'm a little suspicious about (A) and (B), but pretty sure that (C) is impossible. Remember, a complex number is a number with a real and an imaginary part, hence the term "complex." They look like this:

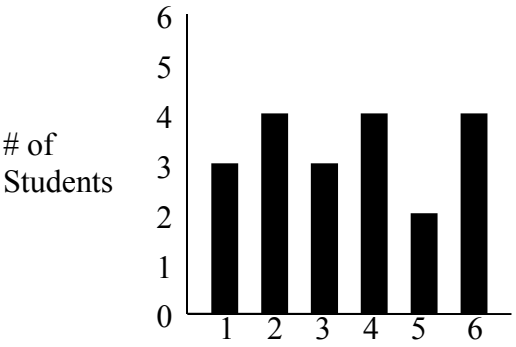
$$2 + 3i$$

See? There's no way to get an "i" from two irrational numbers because i is $\sqrt{-1}$. So I'm pretty sure (C) is the correct answer, but I'm worried about (A) and (B). Playing around with the numbers I see that:

$$\pi + (4 - \pi) = 4$$

π is irrational and $(4 - \pi)$ is irrational and 4 is both an integer and rational. I'm guessing that's what they're thinking.

25. The graph shows the number of days students in Mrs. Adam's class were absent during the school year. The numbers on the horizontal axis represent the number of days absent and the height of the bar represents the number of students who were absent that number of days.



What is the mean number of days absent during the school year?

(A) 3.00

(B) 3.25

(C) 3.50

(D) 3.75

(C) To find the mean (or the average) we add up all the items and then divide by how many items there were. Adding the numbers of absences is tricky but it goes like this:

$$1(3) + 2(4) + 3(3) + 4(4) + 5(2) + 6(4)$$

$$3 + 8 + 9 + 16 + 10 + 24 = 70$$

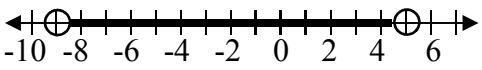
Then let's ad up the number of students:

$$3 + 4 + 3 + 4 + 2 + 4 = 20$$

And then we'll divide the total by the number of students:

$$70 \div 20 = 3.5$$

26. A solution set is graphed on the number line shown.



The solution set of which inequality is shown?

(A) $|x - 7| < 2$

(B) $|x + 7| < 2$

(C) $|x - 2| < 7$

(D) $|x + 2| < 7$

(D) So first, the solution set is $-9 < x < 5$ or said another way $x > -9$ and $x < 5$. So let's solve the inequalities in the problem.

(A) $x - 7 < 2 \quad x - 7 > -2$

$x < 9 \quad x > 5$ NOPE

(B) $x + 7 < 2 \quad x + 7 > -2$

$x < -5 \quad x > -9$ NOPE

(C) $x - 2 < 7 \quad x - 2 > -7$

$x < 9 \quad x > -5$ NOPE

(D) $x + 2 < 7 \quad x + 2 > -7$

$x < 5 \quad x > -9$ YEP

It would have to be (D) wouldn't it? Make us work through all of them?

27. A coin is tossed three times. The table shows the possible outcomes and the probability of each outcome.

COIN TOSS

Number of Tails	Probability
3	$\frac{1}{8}$
2	$\frac{3}{8}$
1	$\frac{3}{8}$
0	$\frac{1}{8}$

What is the expected number of Tails?

(A) $\frac{1}{2}$

(B) 1

(C) $\frac{3}{2}$

(D) 2

(C) To find the "expected value" in probability multiply each outcome by it's probability and then add all those products:

$$3\left(\frac{1}{8}\right)+2\left(\frac{3}{8}\right)+1\left(\frac{3}{8}\right)+0\left(\frac{1}{8}\right)$$

$$\frac{3}{8}+\frac{6}{8}+\frac{3}{8}$$

$$\frac{12}{8}$$

$$\frac{3}{2}$$

28. There are 3.281 feet in one meter. There are 5,280 feet in 1 mile. A car is traveling at a speed of 65 miles per hour. Which expression has a value equal to the car's speed, in meters per minute?

(A) $\frac{65\times 5{,}280}{60\times 3.281}$

(B) $\frac{65\times 5{,}280\times 3.281}{60}$

(C) $\frac{5{,}280}{65\times 60\times 3.281}$

(D) $\frac{65\times 60\times 3.281}{5{,}280}$

(A) Okay, this is unit conversion. Here's how you do it:

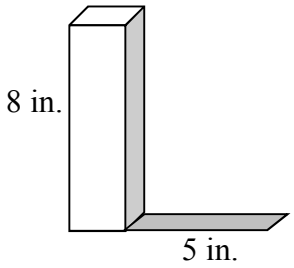
$$\frac{65\ miles}{\sout{1\ hour}}\times\frac{\sout{1\ hour}}{60\ minutes}=\frac{65\ miles}{60\ minutes}$$

$$\frac{65\ \sout{miles}}{60\ minutes}\times\frac{5280\ feet}{1\ \sout{mile}}=\frac{65\times 5280\ feet}{60\ minutes}$$

$$\frac{65\times 5280\ \sout{feet}}{60\ minutes}\times\frac{1\ meter}{3.281\ \sout{feet}}$$

$$=\frac{65\times 5280\ meters}{60\times 3.281\ minutes}$$

29. Allen measures the height of a block to be 8 inches and the length of the shadow of the can to be 5 inches, as shown in the diagram.



At the same time, the shadow of a flagpole is 15 feet in length. What is the height of the flagpole?

(A) 13 feet

(B) 24 feet

(C) 28 feet

(D) 40 feet

(B) Remember, the ISEE loves proportions. Here's the one to set up in this instance:

$$\frac{8\ in}{5\ in} = \frac{x\ ft}{15\ ft}$$

Cross multiply to get:

$$5x = 120$$

$$x = 24$$

30. Which is the most reasonable unit to use when measuring the height of a building?

(A) centimeters

(B) grams

(C) kilograms

(D) meters

(D) You just have to have a sense for how big these measurements are. Centimeters are too small, and grams and kilograms measure mass, not length.

31. Which numerical expression does NOT represent an integer?

(A) $\sqrt{9}-\sqrt{16}$

(B) $\sqrt{9}\times\sqrt{16}$

(C) $\sqrt{16-9}$

(D) $\sqrt{9\times16}$

(C) Let's simplify the answer choices:

For (A):

$$\sqrt{9}-\sqrt{16}=3-4=-1$$ NOPE

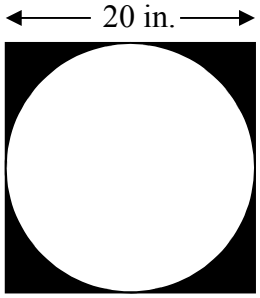
For (B):

$$\sqrt{9}\times\sqrt{16}=3\times4=12$$ NOPE

For (C):

$$\sqrt{16-9}=\sqrt{7}$$ YEP

32. A circle is inscribed in a square with side length 20 in, as shown.



What is the area of the shaded region?

(A) $(80-20\pi)\text{in}^2$

(B) $(80-40\pi)\text{in}^2$

(C) $(400-100\pi)\text{in}^2$

(D) $(400-400\pi)\text{in}^2$

(C) For any "what is the area of the shaded region" problem find the area of the outside figure and subtract the area of the inside figure." For the square:

$$A=s^2$$

$$A=20^2$$

$$A=400$$

For the circle. if you drag the 20 in. down into the center of the circle you'll see that 20 in. is the diameter of the circle, so the radius is 10 in. So the area of the circle is:

$$A=\pi r^2$$

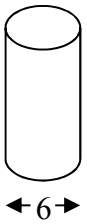
$$A=\pi(10)^2$$

$$A=100\pi$$

So the area of the shaded region is:

$$400-100\pi$$

33. The height of the cylinder shown is 3 times its diameter. The formula for the volume of a cylinder is $V = \pi r^2 h$, where r is the radius of the cylinder and h is the height of the cylinder.



If the diameter of the cylinder is 6 cm, what is its volume, in cm^3?

(A) 648π

(B) 162π

(C) 108π

(D) 54π

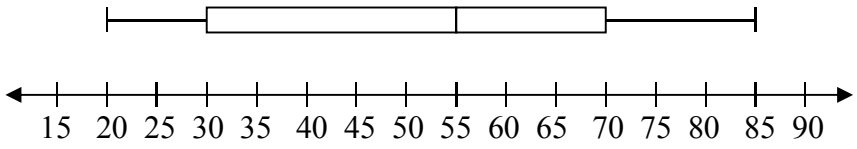
(B) They tell you that the height is 3 times the diameter so if the diameter is 6 then the height is 18. Also, the formula doesn't use the diameter, it uses the radius. Since the radius of a circle is half the diameter, the radius is 3. Now let's use the formula:

$$V = \pi r^2 h$$

$$V = \pi(3)^2(18)$$

$$V = 162$$

34. The box-and-whisker plot below represents the scores of 55 students in Mrs. Martin's Algebra classes.



What is the range of the data?

(A) 70
(B) 65
(C) 55
(D) 30

(B) The range of the data in a box-and-whisker plot is the distance from the left "whisker" (at 20) to the right "whisker" (at 85). This distance is 65.

35. A box contains 5 blue erasers, 6 red erasers, 2 yellow erasers, and 4 green erasers. Sue randomly removes 1 eraser from the box and keeps it. Kathy then randomly removes an eraser from the box. If the eraser Sue removed from the bag was yellow, what is the probability that the eraser Kathy removed was green?

(A) $\frac{4}{16}$

(B) $\frac{4}{17}$

(C) $\frac{2}{17} \times \frac{4}{17}$

(D) $\frac{2}{17} \times \frac{4}{16}$

(A) Okay the total number of erasers is 17. Sue takes a yellow one out, so now there are 16 (and one less yellow so there's only one yellow remaining.) Now Kathy takes one – what's the probability that it's green? The probability of an event happening is:

$$\frac{\#\ of\ ones\ we\ want}{total\ \#\ of\ items}$$

Then the probability of Kathy's being green is:

$$\frac{4}{16}$$

36. Which expression is equivalent to the expression $\sqrt{36x^{36}}$?

(A) $6x^8$

(B) $6x^{18}$

(C) $18x^8$

(D) $18x^{18}$

(B) Here you just have to know the rules for working with radicals. You can actually combine or split radicals when they're MULTIPLIED or DIVIDED (not if they're added or subtracted.) So here we can do this:

$$\sqrt{36x^{36}}$$

$$(\sqrt{36})(\sqrt{x^{36}})$$

$$(6)(\sqrt{x^{36}})$$

Here's where it gets a little complicated. If a number inside the radical has an exponent, just take half of the exponent like this:

$$(6)(\sqrt{x^{36}})$$

$$6x^{1\ 8}$$

Also, if you remember that the square root is the same as raising a number to the ½ power you could do this:

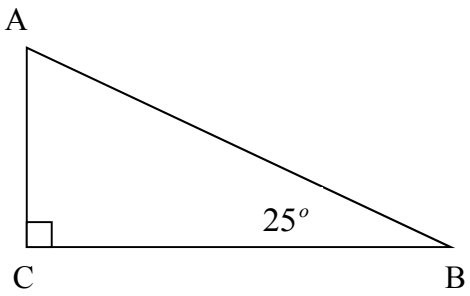
$$(6)(\sqrt{x^{36}})$$

$$(6)(x^{36})^{1/2}$$

Then when a power is raised to another power you multiply the exponents:

$$6x^{1\ 8}$$

37. Triangle ABC is shown. The length of $\overline{AC}$ is 5 in. The measure of angle ABC is 25^o.



The value of which expression is equal to the length of side $\overline{AB}$?

(A) $\frac{5}{\sin 25^o}$

(B) $\frac{\sin 25^o}{5}$

(C) $\frac{5}{\tan 25^o}$

(D) $\frac{\tan 25^o}{5}$

(A) Remember SOH CAH TOA, which means:

Sin is Opposite over Hypotenuse

Cos is Adjacent over Hypotenuse

Tan is Opposite over Adjacent

So, since we have the opposite side (they tell us it's 5 in) and we're looking for the hypotenuse, the function that uses the opposite and the hypotenuse is sin. So let's set up the equation:

$$\sin 25^o = \frac{5}{x}$$

Now solve for x:

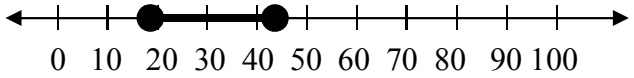
$$\sin 25^o = \frac{5}{x}$$

$$(x)\sin 25^o = 5$$

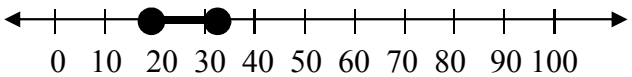
$$x = \frac{5}{\sin 25^o}$$

38. Which graph represents the solution set of the inequality $39 \le 2x + 1 \le 89$?

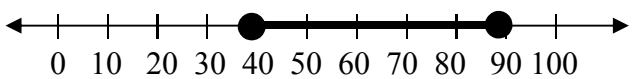
(A)



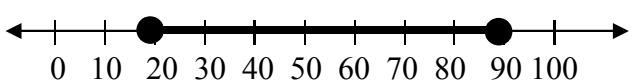
(B)



(C)



(D)



(A) Let's solve the inequality. You can actually solve it all at once – it'll look like a 3 sided inequality:

$$39 \le 2x + 1 \le 89$$

Subtract 1 from all 3 sides:

$$38 \le 2x \le 88$$

Divide all 3 sides by 2:

$$19 \le x \le 44$$

This matches (A)

39. The stem-and-leaf-plot shown represents the temperatures in different cities on a day in summer.

Stem	Leaf
5	5 7 9
6	2 2 3 4 7 7 8
7	4 6 6 7 7 7 8 8 9
8	1 3 3 4 6 7
9	1 2 3 5 7 9 9
10	0 4 7

What is the median temperature on that day?

(A) 70

(B) 75

(C) 78

(D) 80

(C) You probably haven't seen too many stem-and-leaf plots so let me explain them. For the Stem of "5" the leaves represent the numbers 55, 57 and 59. For the Stem of "6" the leaves represent 62, 62, 63, 64, 67, 67 and 68. And so on.

So there are 35 temperatures. That means that our median is going to be the middle number, or the 18th number. If we count from 55, the 18th number is 78.

40. What is the solution set for $x^2 + 64 = 0$

(A) 8

(B) $8i$

(C) ± 8

(D) $\pm 8i$

(D) Tricky. Here's how this one goes:

$$x^2 + 64 = 0$$

$$x^2 = -64$$

$$x = \sqrt{-64}$$

$$x = \left(\sqrt{64}\right)\left(\sqrt{-1}\right)$$

Now remember that when you take a square root in an equation you have to take the positive and negative root.

$$x = \pm 8i$$

41. What is the result of the expression

$$\begin{bmatrix} 3 & 5 \\ 6 & 0 \end{bmatrix} + \begin{bmatrix} 4 & 1 \\ 3 & 2 \end{bmatrix} ?$$

(A) $\begin{bmatrix} 7 & 6 \\ 9 & 2 \end{bmatrix}$

(B) $\begin{bmatrix} 7 & 6 \\ 9 & 0 \end{bmatrix}$

(C) $\begin{bmatrix} 7 & 5 \\ 9 & 0 \end{bmatrix}$

(D) $\begin{bmatrix} 7 & 5 \\ 6 & 2 \end{bmatrix}$

(A) To add with matrices, just add the corresponding cells:

$$\begin{pmatrix} 3 & 5 \\ 6 & 0 \end{pmatrix} + \begin{pmatrix} 4 & 1 \\ 3 & 2 \end{pmatrix}$$

$$\begin{pmatrix} 3+4 & 5+1 \\ 6+3 & 0+2 \end{pmatrix}$$

$$\begin{pmatrix} 7 & 6 \\ 9 & 2 \end{pmatrix}$$

42. The formula for the surface area of a sphere is $SA = 4\pi r^2$ where r is the radius of the sphere. A sphere has a surface area of $64\pi \text{ in}^2$. What is the radius of this sphere?

(A) 2 cm

(B) 4 cm

(C) 8 cm

(D) 16 cm

(B) This one isn't too bad, it just takes some Algebra skills:

$$SA = 4\pi r^2$$

$$64\pi = 4\pi r^2$$

Divide both sides by π:

$$64 = 4r^2$$

Divide both sides by 4:

$$16 = r^2$$

Take the square root of both sides:

$$\pm 4 = r$$

Now since this is a radius, we throw out the –4 because there's no such thing as a negative radius.

43. What is the solution to the inequality $8 < -3x + 2 < 17$?

(A) $2 < x < 5$

(B) $-5 < x < -2$

(C) $x < 5,\ x > 2$

(D) $x < -5,\ x > -2$

(B) Again, we can solve this all at once with a 3 sided inequality:

$$8 < -3x + 2 < 17$$

Subtract 2 from all 3 sides:

$$6 < -3x < 15$$

Divide all 3 sides by –3:

$$-2 > x > -5$$

Did you see the "less than" signs flip to "greater than" signs? You have to do that in inequalities if you ever divide by or multiply by a negative number.

Now, our answer doesn't look like any of the choices, so there's still a little work to do. Let's look at the first half our inequality:

$$-2 > x$$

That means that –2 is greater than x, or said in reverse, "x is less than –2." The only answer that has "x is less than –2" is (B). The other half of (B) is correct as well. In ours we have:

$$x > -5$$

Which reads "x is greater than –5." (B) has "–5 is less than x" which is the same thing.

44. What is the value of the numerical expression $\dfrac{2.4 \times 10^{8}}{6.0 \times 10^{-3}}$?

(A) 4.0×10^{11}

(B) 4.0×10^{10}

(C) 4.0×10^{5}

(D) 4.0×10^{3}

(B) When numbers are in scientific notation like this, first divide the regular numbers:

$$2.4 \div 6.0 = 0.4$$

Then divide the powers of 10. Remember that when you divide numbers with the same base you subtract the exponents:

$$10^{8} \div 10^{-3} = 10^{1\ 1}$$

So at this point we've got:

$$0.4 \times 10^{1\ 1}$$

The problem is that this is not in scientific notation (and it doesn't match any of the answer choices.) For a number to be in scientific notation, the first number must have one digit to the left of the decimal point (and that digit can't be a zero.) So let's adjust. Multiply the 0.4 by 10 and then divide the $\mathbf{10^{11}}$ by 10:

$$0.4 \div 10 = 4.0$$

$$10^{1\ 1} \div 10^{1} = 10^{1\ 0}$$

So our answer is:

$$4.0 \times 10^{1\ 0}$$

45. The first five terms of an arithmetic sequence of numbers are

$-2, 1, 4, 7, 10$

Which expression represents the nth term of this sequence?

(A) $n - 2$

(B) $n + 3$

(C) $3n - 3$

(D) $3n - 5$

(D) I think the easiest way to get these is to test the answer choices. When n = 1 the term is –2:

(A) $n - 2 = (1) - 2 = -1$ NOPE

(B) $n + 3 = (1) + 3 = 4$ NOPE

(C) $3n - 3 = 3(1) - 3 = 1$ NOPE

(D) $3n - 5 = 3(1) - 5 = -2$ YEP

One note here – if (A), (B), or (C) had worked you'd still have to test the others. Sometimes more than one formula will work for one of the terms. But only one formula will work for all the terms.

46. Triangle ABC is similar to triangle LMN. The length of $\overline{AB}$ is 4 in and the length of $\overline{LM}$ is 3 in. If the length of $\overline{BC}$ is 12 in, what is the length of $\overline{MN}$?

(A) 4 in

(B) 8 in

(C) 9 in

(D) 12 in

(C) When triangles are similar, their corresponding sides are proportional. The problem here is you don't have any pictures so you don't know which side corresponds to which. In that case, you can go by the letter order. The triangles are called ABC and LMN. So, side AB corresponds to side LM because both AB and LM are the first two letters. Likewise, BC corresponds to MN and AC corresponds to LN. Now we can set up a proportion:

$$\frac{AB}{LM} = \frac{BC}{MN}$$

You have to keep it organized like this – both the numerators are sides from ABC and both denominators are sides from LMN. Also, the first fraction's numerator and denominator are corresponding sides as are the numerator and denominator of the second fraction. Very important. Now fill in the sides and solve:

$$\frac{4}{3} = \frac{12}{x}$$

$$4x = 36$$

$$x = 9$$

47. The table shows the results of a survey of 90 teenagers. Each teenager was asked about his/her favorite breakfast cereal.

CEREAL	NUMBER OF TEENAGERS
Cheerios	42
Corn Flakes	20
Raisin Bran	18
Other	10

If you make a circle graph with the data, what will the central angle of the portion representing corn flakes be?

(A) 20^o

(B) 40^o

(C) 80^o

(D) 160^o

(C) Okay, 20 of the 90 teenagers liked corn flakes. On a circle graph the central angles of all of the data adds to 360 degrees so instead of out of 90 teenagers we want those 20 corn flake fans to be out of 360 degrees. So we can set up a proportion:

$$\frac{20}{90} = \frac{x}{360}$$

$$90x = 7200$$

$$x = 80$$

Hayutin ISEE practice test – Upper Level QR answer key

Part One – Word Problems
Directions: Choose the best answer from the four choices given.

1. If $x^* = 5x - 2$, then what is the value of 10*?

(A) 48
(B) 50
(C) 52
(D) 58

(A) This looks scary, but don't worry – it's pretty simple. It's like they're giving you a code. Just follow the code:

$$x^* = 5x - 2$$
$$10^* = 5(10) - 2$$

See? Wherever there was an x in the formula we put a 10 in. Then just solve:

$$10^* = 50 - 2$$
$$10^* = 48$$

2. If $2x - y = 6$, then which expression is equal to y?

(A) $2x + 6$
(B) $2x - 6$
(C) $-2x + 6$
(D) $-2x - 6$

(B) Here we just have to solve for y:

$$2x - y = 6$$
$$-y = -2x + 6$$
$$y = 2x - 6$$

3. If the sum of all integers from 1 to 10,000, inclusive, is S, then which expression represents the sum of all integers from 1 to 9,998, inclusive?

(A) $S - 19,999$

(B) $S - 9,999$

(C) $S + 9,999$

(D) $S + 19,999$

(A) 1 to 9,998 is the same as 1 to 10,000 but without adding the last two numbers 9,999 and 10,000. So if we take away those two numbers from S, we'll get the sum of the numbers from 1 to 9,998:

$$S - 9,999 - 10,000$$

$$S - 19,999$$

4. If the length of the height of a triangle is increased by 20% and the length of the base is decreased by 10%, by what percent is the area of the triangle increased?

(A) 6%

(B) 8%

(C) 10%

(D) 12%

(B) You can do this two ways. The first way is using variables:

$$A = \frac{1}{2}bh$$

$$A = \frac{1}{2}(.90b)(1.20h)$$

By the way, did that step make sense? If the base is decreased by 10% then 90% of it will be left, hence the .90 – likewise the height is increased by 20% so there will be 120% of what was there before. Now to simplify:

$$A = \frac{1}{2}(1.08bh)$$

So the area is increased by 8%

The other way to do this is to put just make up values for the base and height and then figure it all out. When making up your own values in a percent problem it works well to use 10 or 100. To keep it small, let's use 10 for both the base and the height:

$$A = \frac{1}{2}(10)(10)$$

$$A = 50$$

Now making the changes:

$$A = \frac{1}{2}(9)(12)$$

$$A = 54$$

Now, that increase of 4 is what percent of 50?

$$4 = x \cdot 50$$

$$.08 = x$$

Which is 8%.

5. If $(x+8)^2 = x^2 + ax + 64$, then what is the value of a, assuming a is positive?

(A) 8

(B) 16

(C) 32

(D) 64

(B) Let's foil out the left and see what that looks like:

$$(x+8)^2 = x^2 + ax + 64$$

$$(x+8)(x+8) = x^2 + ax + 64$$

$$x^2 + 16x + 64 = x^2 + ax + 64$$

See how a = 16?

6. Though he couldn't remember how many points he scored in each of his first 5 games, Mike did know he scored a total of 83 points. If he scored 19 points in his sixth game, then what is the mean number of points he scored per game?

(A) 15.5

(B) 17.0

(C) 18.5

(D) 23.0

(B) Remember to get the average you add up all the items and then divide by how many items there are. Think of it as this formula:

$$\frac{sum\ of\ the\ items}{\#\ of\ items} = average$$

So let's use that formula here:

$$\frac{83+19}{6} = average$$

Notice that the 83 is what we would have gotten if we knew how many points Mike scored in each of his first 5 games. Now simplifying:

$$\frac{102}{6} = average$$

$$17 = average$$

7. A rectangle with an area of 132 cm^2 has a length and width that are measured in whole centimeters. What is the least possible perimeter of this rectangle?

(A) 23

(B) 42

(C) 46

(D) 63

(C) Interesting problem – especially the "has a length and width that are measured in whole centimeters" part. What could that mean? Well, let's see… They give us the area. The formula for the area of a rectangle is:

$$A = lw$$

So let's play around and see what the length and width might be:

$$A = lw$$

$$132 = lw$$

$$132 = 2 \cdot 66$$

$$132 = 3 \cdot 44$$

$$132 = 4 \cdot 33$$

$$132 = 6 \cdot 22$$

$$132 = 12 \cdot 11$$

Ah, that's what they mean by "measured in whole centimeters." See if they didn't say that, then all the decimals would be fair game which would make an infinite number of possible length-width pairs. So, which one of those pairs makes the smallest perimeter:

$$Perimeter = 2l + 2w$$

$$P = 2(66) + 2(2) = 136$$

$$P = 2(44) + 2(3) = 94$$

$$P = 2(33) + 2(4) = 74$$

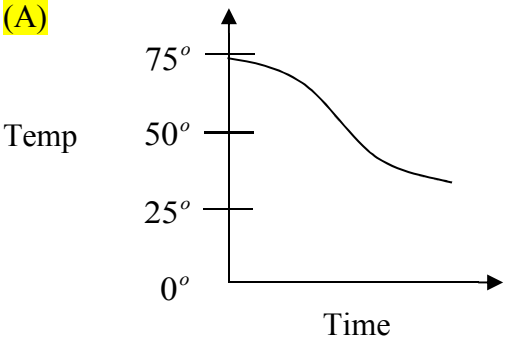
$$P = 2(22) + 2(6) = 56$$

$$P = 2(12) + 2(11) = 46$$

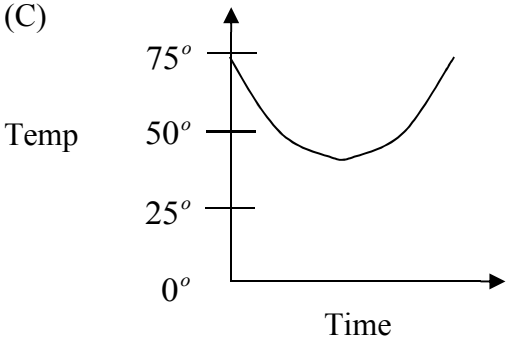
Now that was a lot of work, so to save you time in the future, know that the smallest perimeter happens when the length and width are closest together – like 12 and 11.

8. Jim refills his ice trays with water and puts them in the freezer (32^{o}F). Which graph best represents the temperature of the water in the trays?

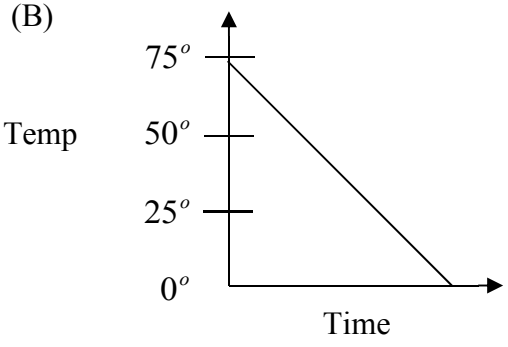
(A)



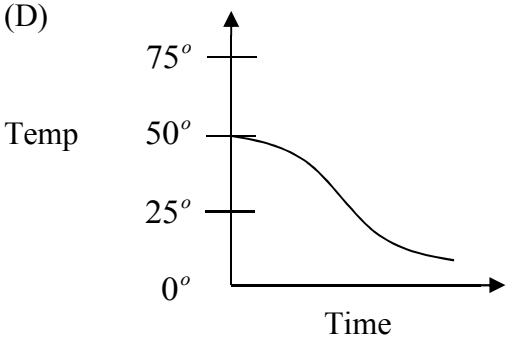
(C)



(B)

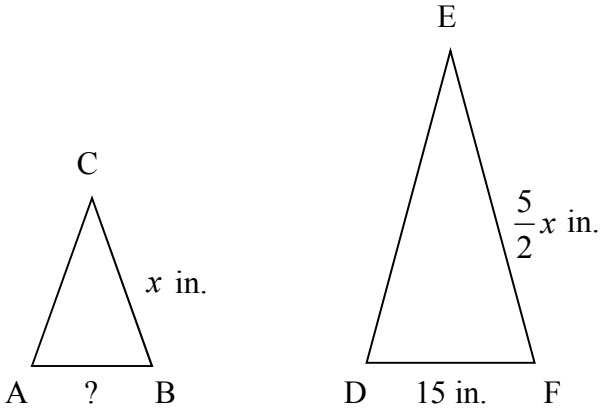


(D)



(A) Remember that water freezes at 32 degrees Fahrenheit. So assuming Jim filled the trays with room temperature water (like 70 degrees Fahrenheit) and the water in the trays cooled until they hit 32 degrees, (A) looks like the best graph.

9. Triangle ABC is similar to triangle DEF. Numbers shown represent the lengths of the sides.



What is the length of side AB?

(A) 2 in

(B) 6 in

(C) $2x$ in

(D) $6x$ in

(B) At first glance this looks impossible – there are too many unknowns. But let's set up the proportion and see what happens:

$$\frac{\frac{5}{2}x}{x} = \frac{15}{y}$$

I set y as the unknown side AB. Now see how the x's cancel out (Although "cancel out" isn't a very mathematical term. In strict mathematical terms, x/x is equal to 1 and then 5/2 times 1 equals 5/2):

$$\frac{5}{2} = \frac{15}{y}$$

$$5y = 30$$

$$y = 6$$

10. What is the value of the following expression?

$$\frac{4\left(4^2+4^3\right)}{16\left(4+4^2\right)}$$

(A) 0

(B) 1

(C) 4

(D) 16

(B) Interesting. We could multiply everything out and divide, but let's see if there's a quicker way to do this:

$$\frac{4(4^2+4^3)}{16(4+4^2)}$$

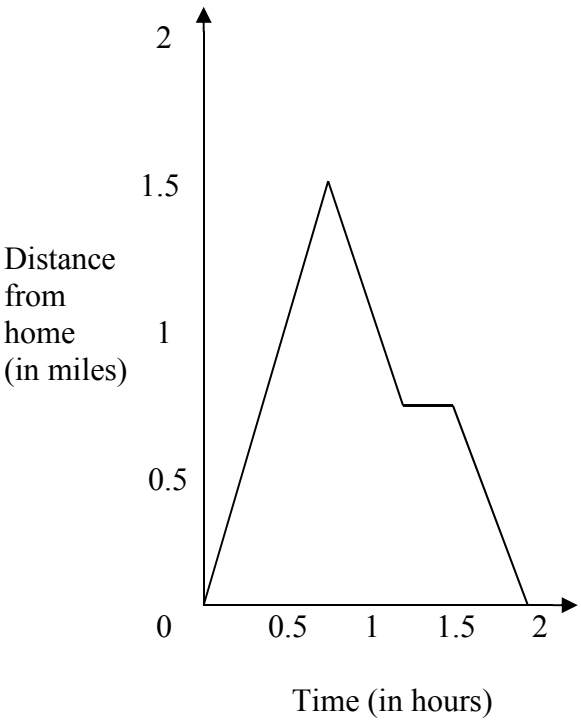
$$\frac{(4^2+4^3)}{4(4+4^2)}$$

I can do that because there were multiplication problems in the numerator and denominator. Careful with this – you can only reduce parts of the numerator and denominator if those parts are being multiplied.

$$\frac{(4^2+4^3)}{(4^2+4^3)}$$

See what I did there? I distributed the 4 into the expression in the denominator. Now I have the same expression in the numerator and denominator. That's 1.

11. Bob recently took his dog for a walk. The graph shows his distance from home as a function of time.



At one point, Bob stopped to talk to a neighbor for a few minutes. How far was he from home when he stopped?

(A) .75 miles

(B) 1.00 miles

(C) 1.25 miles

(D) 1.50 miles

(A) If Bob stopped that means he was staying the same distance from home for a bit. See how that happens from around 1.25 hours to 1.5 hours? And his distance from home at that time was about 0.75 miles? Careful not to Choose (C) or (D) – if you did you mixed up the time and the distance. Distance is on the y-axis.

12. Allen took the temperature in his backyard for 30 successive Mondays. Then he calculated the mean, median, mode and range for the temperatures.

MEASURE	VALUE
Mean	53^o
Median	58^o
Mode	52^o
Range	55^o

Allen later realized his thermometer gives readings that are 5^o too low, so he added 5^o to each of his readings and then recalculated. Which of these measures changed the least?

(A) mean
(B) median
(C) mode
(D) range

(D) The range is the distance between the lowest temperature and the highest temperature. So if he added 5 degrees to all of the temperatures, the lowest would get 5 degrees higher, but so would the highest. So the range would stay the same. A hypothetical example might help:

$lowest\ temp$: 38°F

$highest\ temp$: 71°F

By the way, I just made these numbers up. So the range would be 71 – 38 = 33. Now let's adjust the numbers like it says in the problem:

$lowest\ temp$: $38°F + 5°F = 43°F$

$highest\ temp$: $71°F + 5°F = 76°F$

The new range is 76 – 43 = 33, same as before.

13. Ted and Susan are playing a game using number cubes, numbered 1 through 6. Each of them rolls two number cubes, and the sum of the numbers is recorded.

- Ted gets a point if his sum is a 6.
- Susan gets a point if her sum is a 5 or 2.

Who has the greater probability of receiving a point?

(A) Ted

(B) Susan

(C) Ted and Susan have the same probability of receiving a point.

(D) There is not enough information to determine the answer.

(C) The number of possibilities for the first roll is 6 and for the second roll it's also 6 so there are 36 possible combinations of rolls. (Like a 1 then a 1, a 1 then a 2, a 1 then a 3, etc…) How many will get you a 6?

1 then 5, 5 then 1

2 then 4, 4 then 2

3 then 3

So 5 out of the 36. How many will get you a 5 or a 2? For a 5:

1 then 4, 4 then 1

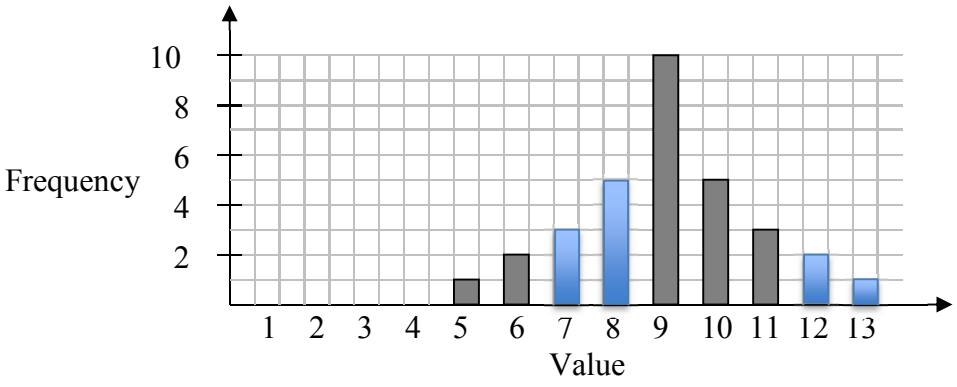
2 then 3, 3 then 2

And for a 2:

1 then 1

So 5 out of the 36 – same as for the 6.

14. A scientist collects data. She determines that both the mean and the median of the data are equal to 9 and the data are symmetric about this value. She begins to create the bar graph shown but does not finish it.



If the range of the data is 8 and the maximum value of the data is 13, then how many data points fall above the value 9?

(A) 3

(B) 5

(C) 8

(D) 11

(D) Okay if the data are symmetric about 9, then we can copy the bars from one side of the bar at 9 and put them on the other so it looks symmetrical. I've done that on the figure above. Now the question is, how many data points fall above the value of 9?

There are 5 10's

There are 3 11's

There are 2 12's

There is 1 13.

So 5 + 3 + 2 + 1 = 11

15. What is the maximum value for y if $y = 3x^2 - 2$ for $-3 \le x \le 2$?

(A) 2

(B) 10

(C) 16

(D) 29

(C) Let's plug in the whole values of x to see what we get for y:

$y = 3(-3)^2 - 2 = 16$

$y = 3(-2)^2 - 2 = 10$

$y = 3(-1)^2 - 2 = 1$

$y = 3(0)^2 - 2 = -2$

$y = 3(1)^2 - 2 = 1$

$y = 3(2)^2 - 2 = 10$

16. If x is a factor of 25 and y is a factor of 40, which is the least value that xy must be a factor of?

(A) 5

(B) 10

(C) 200

(D) 1,000

(C) This one is tricky. Let's talk about x. It's a factor of 25 so it could be:

1, 5, or 25

Now let's talk y. It's a factor of 40 so it could be:

1,2,4, 5, 8, 10, 20, or 40

Let's look at the lowest and highest scenarios.

If x = 1 and y = 1, then the least value xy could be a factor of would be 1.

If x = 25 and y = 40, then the least value xy could be a factor of would be 200 since 200 is the lowest number that 25 and 40 both go into.

So since we don't know what x and y are, and because they use the word "must" we have to choose the worst case scenario – that x = 25 and y = 40. So the answer is 200.

17. Mario and Luigi were both driving on the same road, each at a constant speed. Mario started driving 20 minutes before Luigi. Luigi drives at a faster speed that Mario. Which one piece of additional information would be needed to determine how long Mario had been driving when Luigi caught up with him?

(A) Mario's speed

(B) Luigi's speed

(C) the sum of their speeds

(D) none of these

(D) This is a distance = rate times time problem. So we have three variables for each person for a total of 6 variables. Let's assign some variables. Luigi catches up with Mario so the distance they travelled is the same:

Mario's distance = d

Luigi's distance = d

Mario started driving 20 minutes before Luigi so we can assign the time these variables:

Mario's time = t

Luigi's time = t – 20

We don't know anything about their rates except that Luigi drives faster so:

Mario's rate = M

Luigi's rate = L (L's look like 1's lower case so let's use upper case here)

So Mario's d = rt looks like this:

d = Mt

And Luigi's looks like this:

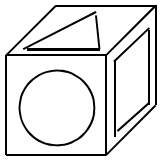
d = L(t – 20)

Now with substitution we can get rid of the "d" variable and make it one equation:

Mt = L(t – 20)

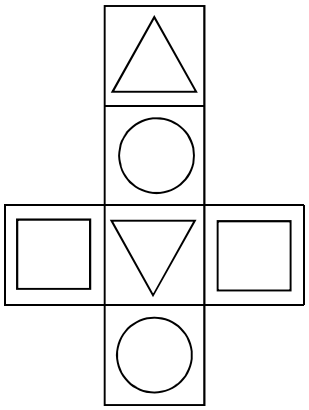
Look at the answer choices. If we have (A) Mario's speed, we get rid of "M" but we still have two variables in one equation. That's unsolvable. If we have (B) Luigi's speed, same problem. If we have (C) the sum of their speeds, we'll have a new equation M + L = something and we'll be able to substitute and get rid of one of the speed variables, but we'll still have the 2 variables and one equation problem. So the answer is (D). Wow. Might want to skip this one if you get one like it…

18. A cube is shown.

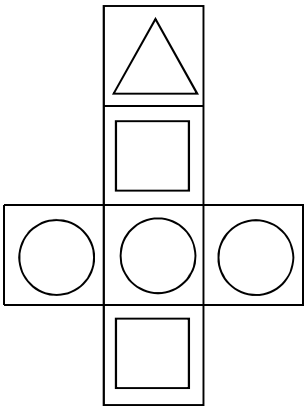


Which figure is a possible net for the cube?

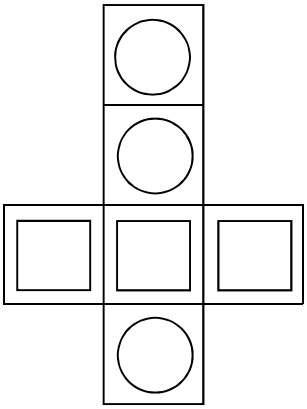
(A)



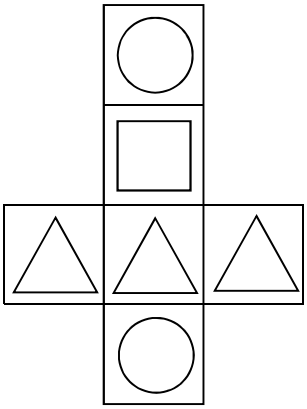
(C)



(B)



(D)



(A) This one is tough if you have trouble visualizing 3D objects. But let's start with this: You'll need a circle under a triangle. See that in the cube? So we can eliminate (B) and (C). Now we need a square to the right of the triangle that has the circle under it and (A) is the only one that has that.

19. The formula for the volume of a cylinder is $\pi r^2 h$. The volume of cylinder A is 3 times the volume of cylinder B. Which statement could be true?

(A) The radius of cylinder A is 3 times the radius of cylinder B, but their heights are the same.

(B) The height of cylinder A is 3 times the height of cylinder B, but their radii are the same.

(C) The height of cylinder A is 3 times the height of cylinder B, and the radius of cylinder A is $\frac{1}{3}$ the radius of cylinder B.

(D) Both the height and radius of cylinder A are 3 times the height and radius of cylinder B, respectively.

(B) There's an algebraic way to do this, but making up some values might be easier. Let's say the radius for cylinder B is 5 and the height for cylinder B is 10. That means that the volume of cylinder B is:

(A) $V = \pi r^2 h = \pi(5)^2(10) = 250\pi$

Now let's see which answer choice gets us a volume of A that is 3 times that (like it says in the problem). 3 times 250π would be 750π:

(A) $V = \pi r^2 h = \pi(15)^2(10) = 2250\pi$ NOPE

(B) $V = \pi r^2 h = \pi(5)^2(30) = 750\pi$ YEP

By the way, see how I made up values for cylinder B instead of cylinder A? That's because if you look at the answer choices, in each one the dimensions of A depend on B. Had I made up values for A instead, it would have been a lot harder.

20. If $x^2 + y^2 = 52$ and $xy = 24$, what is the value of $(x + y)^2$?

(A) 4

(B) 13

(C) 100

(D) 864

(C) Don't try to solve this like you would in Algebra class – you'll end up with some nasty fractions. Let's just play around with the equations by guessing numbers. I like the second equation:

$$xy = 24$$

$$(8)(3) = 24$$

Okay let's try those in the second equation:

$$x^2 + y^2 = 52$$

$$(8)^2 + (3)^2 = 52$$

$$73 = 52$$

Shoot. I knew I should have chosen 6 and 4… Let's try those:

$$x^2 + y^2 = 52$$

$$(6)^2 + (4)^2 = 52$$

$$52 = 52$$

Perfect. Now, what's the value of $(x + y)^2$***?***

$$(6 + 4)^2$$

$$10^2$$

$$100$$

Part Two – Quantitative Comparisons

Directions: Using the information given in each question, compare the quantity in Column A to the quantity in Column B. All questions in Part Two have these answer choices:

(A) The quantity in Column A is greater.
(B) The quantity in Column B is greater.
(C) The two quantities are equal.
(D) The relationship cannot be determined from the information given.

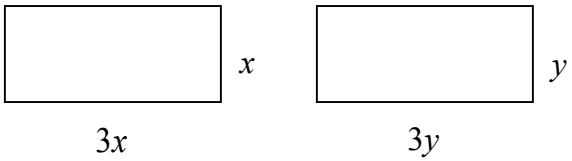
	Column A	Column B
21.	$4+3\times(5+2)$	19

The answer is (A) because…

Column A:

$$4+3\times(5+2)$$
$$4+3\times(7)$$
$$4+21$$
$$25$$

Rectangle Q Rectangle R



Note: Figures not drawn to scale.

The perimeter of Rectangle Q is 32 in^2.
The area of Rectangle R is 27 in^2.

	Column A	Column B
22.	x	y

The answer is (A) because…

Column A:

The perimeter of a rectangle: $P = 2l + 2w$

$$32 = 2(3x) + 2(x)$$
$$32 = 6x + 2x$$
$$32 = 8x$$
$$4 = x$$

Column B:

The area of a rectangle is: $A = lw$

$$27 = (3y)(y)$$
$$27 = 3y^2$$
$$9 = y^2$$
$$3 = y$$

	Column A	Column B
23.	$(a+b)(a^2-ab+b^2)$	a^3+b^3

The answer is (C) because…

Column A:

Distribute the a and then distribute the b and then simplify:

$$(a+b)(a^2-ab+b^2)$$
$$a^3-a^2b+ab^2+a^2b-ab^2+b^3$$
$$a^3+b^3$$

A bag filled with $11.00 in dimes and quarters contains 3 times as many dimes as quarters.
(Note: 1 dime = $.10; 1 quarter = $.25)

	Column A	Column B
24.	The total value of the dimes	$6.50

The answer is (B) because…

Column A:

Let's create some equations! We'll let d = the number of dimes and q = the number of quarters. So our two equations will look like this:

$$0.10d + 0.25q = 11.00$$

$$d = 3q$$

Now substitute and solve:

$$0.10(3q) + 0.25q = 11.00$$

I'm not a big fan of decimals. Let's multiply both sides by 100.

$$10(3q) + 25q = 1100$$

$$30q + 25q = 1100$$

$$55q = 1100$$

$$q = 20$$

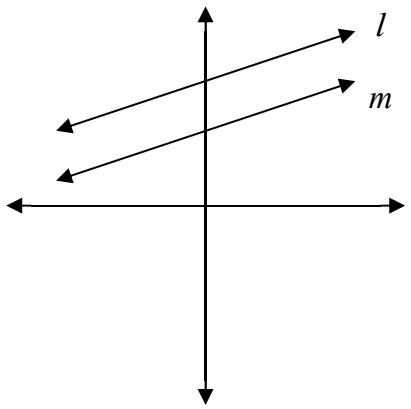
But they're asking for the total value of the dimes:

$$d = 3q$$

$$d = 3(20)$$

$$d = 60$$

Multiply that by 0.10 and we get $6.00



Line l is the graph of $y = \frac{1}{3}x + 5$. Line m is parallel to line l

	Column A	Column B
25.	The slope of line m	–3

The answer is (A) because…

Column A:

Parallel lines have the same slope. So since line l has a slope of 1/3 (in y = mx + b form the "m" is the slope), then line m has to have a slope of 1/3 as well. 1/3 is bigger than –3.

The perimeter of a rectangle is 54 cm.

	Column A	Column B
26.	The area of the rectangle	$170\ \text{cm}^2$

The answer is (D) because…

Column A:

Okay let's look at the extremes. If the perimeter is 54 cm and P = 2l + 2w:

$$54 = 2(26) + 2(1)$$

Okay so l = 26 and w = 1 will work, what's the area of that rectangle?

$$A = lw$$

$$A = (26)(1)$$

$$A = 26$$

Let's try some numbers that are closer together:

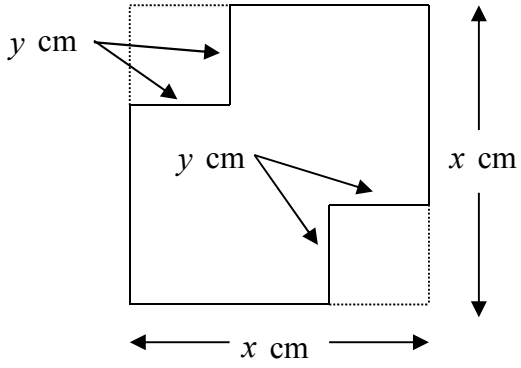
$$54 = 2(13) + 2(14)$$

Now let's figure the area:

$$A = (13)(14)$$

$$A = 182$$

In the figure below, all angles that appear to be right angles are right angles.



Note: Figure not drawn to scale

	Column A	Column B
27.	Area of the interior region	$x^2 - 2xy - 2y^2\ \text{cm}^2$

The answer is (A) because…

Column A:

Let's get the area of the whole thing and then subtract the corners that are cut out:

$$A = lw = (x)(x) = x^2$$

Now the corners are:

$$A = lw = (y)(y) = y^2$$

So the area of the figure is:

$$x^2 - y^2$$

Column B also starts with x^2 but it has more stuff subtracted from it – most notably the $2y^2$ at the end which is definitely bigger than the y^2 in the expression in column A.

The product of 3 consecutive integers is 336.

	Column A	Column B
28.	The greatest of the 3 consecutive integers	11

The answer is (B) because:

Column A:

Let's create an equation to figure out what the integers are:

$$(x)(x+1)(x+2) = 336$$

Scratch that. That's a headache waiting to happen. Let's guess and check:

$$(10)(11)(12) = 1320$$

Way too high. Let's try again:

$$(5)(6)(7) = 210$$

Closer… How about:

$$(6)(7)(8) = 336$$

Perfect. The greatest of these is 8 so Column B is bigger.

	Column A	Column B
29.	$2x - 5$	$2(x-5)$

The answer is (A) because…

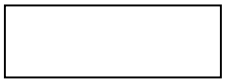
Column B:

$$2(x-5)$$

$$2x - 10$$

It doesn't matter what 2x is. If you take 5 away from it you'll have a bigger number than if you take 10 away from it

Rectangle A



Square B

Note: Figures not drawn to scale.

	Column A	Column B
30.	The perimeter of Rectangle A	The perimeter of Square B

The answer is (C) because…

Column A:

$P = 2l + 2w$

$P = 2(1.5y) + 2(0.5y)$

$P = 3y + y$

$P = 4y$

Column B:

$P = 2l + 2w$

$P = 2(y) + 2(y)$

$P = 2y + 2y$

$P = 4y$

A 6-sided number cube, numbered 1 to 6, is rolled and a coin is tossed.

	Column A	Column B
31.	If a number more than 4 is rolled on the cube, the probability of the coin landing heads up	If an even number is rolled on the cube, the probability of the coin landing tails up

The answer is (C) because…

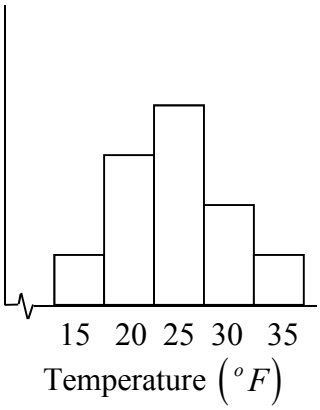
Column A:

The first condition is a given – they're telling us that a number more than 4 is rolled, so we don't include that probability in our calculation. So it's just the probability of a coin landing heads up: ½

Column B:

Again, the first condition is given so we don't include that in our calculation. It's just the probability of a coin landing tails up: ½

# of days at that temperature



The histogram shows temperatures calculated during an experiment.

	Column A	Column B
32.	The median score	The range of the scores

The answer is (A) because…

Column A:

The median score is the score in the middle if you put them in order. Since they don't give us the numbers on the y-axis, we can't calculate it that way. But the bar representing 25 is large enough and the number of values on either side are similar enough to conclude that 25 is the median.

Column B:

The range is the highest score – the lowest score or 35 – 15 = 20

A pencil case contains 7 pencils: 4 blue pencils and 3 red pencils. One pencil is selected at random and replaced. Then a second pencil is selected.

	Column A	Column B
33.	The probability that both pencils selected are red	The probability that the first pencil selected is red

The answer is (B) because…

Column A:

Remember probability is:

$$\frac{\#\ of\ items\ we\ want}{total\ \#\ of\ items}$$

And if there are multiple events you multiply the probabilities together:

$$\frac{3}{7} \times \frac{3}{7} = \frac{9}{49}$$

The probability is 3/7 both times because the first pencil is replaced after it is selected.

Column B:

$$\frac{3}{7}$$

It's tough to compare this to the 9/49 in A… Let's find a common denominator:

$$\frac{3}{7} \times \frac{7}{7} = \frac{21}{49}$$

In June, grapes were selling for $2.50 a pound. In July, the price of grapes was 20% higher than the June price. In August, the price of grapes was 20% lower than the July price.

	Column A	Column B
34.	The price of grapes in August	$2.50

The answer is (B) because…

Column A:

The ISEE is counting on you making the mistake of thinking these are equal. I mean, if it goes up 20%, then comes back down 20%, then it doesn't change, right? Wrong. Check it out:

July price = June price + 20%

20% of $2.50 is $0.50 so…

July price = $3.00

Now in August the price falls 20%:

August price = July price – 20%

20% of $3.00 is $0.60 so…

August price = $2.40

Strange, huh?

The sum of the interior angles of a polygon with n sides is $180(n-2)$.

	Column A	Column B
35.	The measure of an interior angle of a regular triangle	The measure of an interior angle of a regular rectangle

The answer is (B) because…

Column A:

Okay, let's use the formula to figure out the sum of the interior angles of a triangle:

$180(\mathrm{n}-2)$

$180(3-2)$

$180(1)$

180

Now, they tell us the triangle is "regular" which means that all the sides and all the angles have the same measurement. So if there are 3 angles and they add up to 180 degrees, then each angle is 60 degrees.

Column B:

Again, let's use the formula:

$180(\mathrm{n}-2)$

$180(4-2)$

$180(2)$

360

They tell us this rectangle is also "regular" which makes it a square and all of the angles are 90 degrees.

	Column A	Column B
36.	$\left(\frac{1}{11}\right)^{-2}$	$\left(\frac{1}{11}\right)^{-\frac{1}{2}}$

The answer is (A) because…

Column A:

Remember that negative exponents make you flip the fraction:

$\left(\frac{1}{11}\right)^{-2}$

$\left(\frac{11}{1}\right)^{2}$

$(11)^2$

121

Column B:

Remember that a fraction in the exponent means you'll be taking a root:

$\left(\frac{1}{11}\right)^{-\frac{1}{2}}$

$\left(\frac{11}{1}\right)^{\frac{1}{2}}$

$(11)^{\frac{1}{2}}$

$\sqrt{11} = somewhere\ between\ 3\ and\ 4$

	Column A	Column B
37.	$3x^2$	$2x^3$

The answer is (D) because…

When they don't tell us what x is, we need to cover all of our bases so let's try a negative number, zero, and a positive number:

If x = –3…

Column A:

$$3x^2 = 3(-3)^2 = 3(9) = 27$$

Column B:

$$2x^3 = 2(-3)^3 = 2(-27) = -54$$

If x = 0

Column A:

$$3x^2 = 3(0)^2 = 3(0) = 0$$

Column B:

$$2x^3 = 2(0)^3 = 2(0) = 0$$

So we can stop there, since once we got Column A is bigger and once we got that the columns are equal – that means that there is not enough information.