

Math Mammoth Grade 6 End of the Year Test Notes

This test is very long, because it contains questions on all major topics covered in *Math Mammoth Grade 6 Complete Curriculum*. Its main purpose is to be a diagnostic test—to find out what the student knows and doesn't know. The questions are quite basic and do not involve especially difficult word problems. Because this test is so comprehensive, it can be used as a pre-algebra pre-test to find out if a student is ready for pre-algebra.

Since the test is so long, I do not recommend that you have your student to do it in one sitting. Break it into 3-5 parts and administer them on consecutive days, or perhaps on morning/evening/morning/evening. There is no need to impose strict time limits. Use your judgment.

A calculator is not allowed.

The test is evaluating the student's ability in the following content areas:

- exponents
- order of operations
- the basic concepts of an equation and expression
- ratios & proportions, including word problems
- all operations with decimals
- prime factorization
- all operations with fractions, including word problems
- concept of percent
- basic word problems with percent
- measuring units (in problems throughout the test)
- angles
- understanding basic shapes
- finding the area of basic shapes
- circumference and area of circles
- volume and surface area
- the four operations with integers
- simple and compound probability
- mean, median, and mode
- histogram and stem-and-leaf plot

The score of 80% is considered passing score. A student scoring at least that can confidently go to studying any regular pre-algebra program.

A student scoring between 70% and 80% may need just some remediation in problem areas before going on to pre-algebra.

A student scoring between 50% and 70% will probably benefit from studying Math Mammoth Grade 6 complete curriculum.

A student scoring less than 50% should take the end-of-year test for 5th grade, to check if s/he can pass it, because it is possible that Math Mammoth 6th grade would be too difficult, and s/he might need to go down a level.

Grading

Question #	Max. points	Student score
The Basic Operations and Place Value		
1	6 points	
2	4 points	
3	8 points	
4	3 points	
5	2 points	
6	2 points	
7	4 points	
<i>subtotal</i>		/ 29
Ratios and Proportions		
8	4 points	
9	4 points	
10	4 points	
11	4 points	
12	4 points	
13	2 points	
14	4 points	
15	3 points	
<i>subtotal</i>		/ 29
Decimals		
16	4 points	
17	3 points	
18	2 points	
19	6 points	
20	3 points	
21	6 points	
22	6 points	
23	6 points	
24	3 points	
25	3 points	
26	2 points	
27	4 points	
28	3 points	
29	4 points	
30	4 points	
31	3 points	
32	3 points	
<i>subtotal</i>		/65

Question #	Max. points	Student score
Number Theory		
33	2 points	
34	6 points	
35	6 points	
36	2 points	
37	2 points	
<i>subtotal</i>		/ 18
Fractions		
38	4 points	
39	4 points	
40	4 points	
41	2 points	
42	3 points	
43	4 points	
44	3 points	
45	2 points	
46	4 points	
47	3 points	
48	4 points	
<i>subtotal</i>		/ 37
Percent		
49	12 points	
50	4 points	
51	2 points	
52	2 points	
53	2 points	
54	2 points	
55	2 points	
56	2 points	
57	2 points	
<i>subtotal</i>		/ 30

Question #	Max. points	Student score
Geometry		
58	2 points	
59	4 points	
60	2 points	
61	2 points	
62	2 points	
63	2 points	
64	3 points	
65	3 points	
66	3 points	
<i>subtotal</i>		/ 23

Question #	Max. points	Student score
Integers		
67	2 points	
68	4 points	
69	8 points	
70	6 points	
71	6 points	
72	6 points	
73	4 points	
<i>subtotal</i>		/ 36
Statistics & Probability		
74	3 points	
75	2 points	
76	6 points	
77a	1 point	
77b	1 point	
77c	2 points	
78	4 points	
79	2 points	
<i>subtotal</i>		/ 21
TOTAL		/288

The total is 288 points. A score of 230 points is 80%.

Math Mammoth End of the Year Test - Grade 6

The Basic Operations and Place Value

1. Solve.

a. 5^2

b. 10^4

c. 1^5

d. 2^4

e. 10^2

f. 3^3

2. a. The area of a square is 100 m^2 . What is its perimeter?

b. The volume of a cube is 27 cubic inches. How long is its side?

3. Calculate in the correct order.

a. $120 + 3 \times 10$

b. $2^3 \div 2 + 5$

c. $40 - (2 + 4)^2$

d. $\frac{30 \times 50}{10 - 5} \times (15 + 5)$

4. Write as numbers.

a. 5 billion, 80 million, 7 thousand

b. 6 trillion, 392 million, five hundred

c. 9 trillion, 20 billion, 154 million

5. Write in normal form (as a number).

a. $2 \times 10^5 + 9 \times 10^4 + 7 \times 10^2$

b. $9 \times 10^8 + 5 \times 10^6 + 3 \times 10^5$

6. Evaluate the expressions when the value of the variable is given.

a. $3x + 8$ when $x = 6$

b. $\frac{40}{y} \times 12$ when $y = 8$

7. Solve the equations. You can just think logically!

a. $800 + x = 920$

b. $x - 250 = 250$

c. $6x = 420$

d. $\frac{x}{9} = 800$

Ratios and Proportions

8. Simplify the ratios.

a. 2:6

b. 9 balls to 12 triangles

c. 200 g to 2 kg

d. 15:21

9. Fill in the missing numbers to form equivalent rates.

a. $\frac{7 \text{ km}}{30 \text{ min}} = \frac{\quad}{15 \text{ min}} = \frac{\quad}{45 \text{ min}}$

b. $\frac{\$96}{8 \text{ hr}} = \frac{\quad}{2 \text{ hr}} = \frac{\quad}{10 \text{ hr}}$

10. Eileen mixes juice concentrate and water in the ratio of 2:5, to get diluted juice.
She uses 80 ml of juice concentrate.

How much water will she need?

How much diluted juice will she get?

11. Solve the following proportions. Give your answer as a mixed number.

$$\mathbf{a.} \quad \frac{x}{5} = \frac{7}{3}$$

$$\mathbf{b.} \quad \frac{11}{214} = \frac{2}{M}$$

12. Solve. Show your work.

Harry can swim 20 laps in a pool in 18 minutes (swimming at a constant speed).
How many laps could he swim in 45 minutes? (Swimming with the same speed.)

13. Write a proportion. *You do not have to solve it. Just write the proportion*

To purchase 600 bales of hay costs \$3,300.
How many bales would you get with \$2,500?

_____ = _____

14. A car can go 80 km on 7 liters of gasoline (traveling with constant speed).

a. How many liters of gasoline would the car need for a trip of 54 km?

b. How far can the car travel on 18 liters of gasoline?

15. A rectangle's length and width are in the ratio of 2:5, and its perimeter is 140 cm.
What are the rectangle's length and width?

Decimals

16. Write as decimals.

a. three thousandths

b. 12 tenths

c. 67534 millionths

d. 27 ten-thousandths

17. Write as fractions or mixed numbers.

a. 0.034

b. 0.03467

c. 3.92432

18. Write in order from the smallest to the greatest.

a. 0.017 0.701 0.0711

b. 1.000306 1.00404 1.0403

19. Add mentally.

a.

$0.4 + 0.7 = \underline{\hspace{2cm}}$

$0.4 + 0.07 = \underline{\hspace{2cm}}$

b.

$0.02 + 0.06 = \underline{\hspace{2cm}}$

$0.02 + 0.0006 = \underline{\hspace{2cm}}$

c.

$0.009 + 0.007 = \underline{\hspace{2cm}}$

$0.00009 + 0.007 = \underline{\hspace{2cm}}$

20. Add or subtract mentally. Give your answers in decimals.

a. $1 \frac{4}{10} + 0.06$

b. $0.1 + \frac{72}{100}$

c. $3.005 - \frac{2}{1000}$

21. Multiply mentally.

a. $0.8 \times 7 = \underline{\hspace{2cm}}$

b. $10 \times 0.0005 = \underline{\hspace{2cm}}$

c. $400 \times 0.09 = \underline{\hspace{2cm}}$

d. $0.08 \times 0.07 = \underline{\hspace{2cm}}$

e. $1000 \times 0.05 = \underline{\hspace{2cm}}$

f. $0.012 \times 0.004 = \underline{\hspace{2cm}}$

22. Divide mentally.

a. $0.036 \div 6 = \underline{\hspace{2cm}}$

b. $3 \div 1000 = \underline{\hspace{2cm}}$

c. $3.4 \div 100 = \underline{\hspace{2cm}}$

d. $0.0048 \div 8 = \underline{\hspace{2cm}}$

e. $0.07 \div 10 = \underline{\hspace{2cm}}$

f. $710 \div 1000 = \underline{\hspace{2cm}}$

23. Round to...

Number:	0.229748	1.056734	3.3349725
...three decimals			
...to the nearest ten-thousandth			

24. Find the value of the expression $6y$ when

a. $y = 0.02$	b. $y = 0.0002$	c. $y = 0.00002$
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25. Calculate.

a. $0.93 + 1.3827$	b. $5.612 - 3.284378$	c. 2.3×0.78
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26. Write as decimals. Round to five decimal digits.

a. $\frac{3}{7}$	b. $1\frac{2}{3}$
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27. Multiply both the dividend and the divisor so that you get a *whole-number divisor*. Then divide using long division. Round the answers to the nearest thousandth.

a. $6.45 \div 0.3$	b. $12.075 \div 0.05$
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28. You are packing books that weigh 14 oz each into a box that must not weigh more than 9 pounds. How many books can you put into the box?

29. Convert to the given unit. You may need the space for calculations.

a. 52 oz = _____ lb

b. 1.3 lb = _____ oz

c. 3.6 ft = _____ in

d. 76 in = _____ ft

30. Convert the measurements to the given units.

a. 125 cm = _____ m = _____ mm **b.** 300 g = _____ kg = _____ mg

31. You need 300 ml of flour for a cake. A flour bag has 2 kg of flour, and 1 kg of flour equals 1.6 liters. How many cakes can you make from the bag of flour?

32. A laptop weighs 3.3 kg, and its case weighs 650 grams.
The airline has an 18-kg limit for your carry-on luggage.
If you take the laptop with its case, how much weight is left
for the rest of your carry-on luggage?

Number Theory

33. Is 283 divisible by 24? Justify your answer.

34. Mark an 'x' if the number is divisible by 2, 3, 4, 5, 6, or 9.

Divisible by	2	3	4	5	6	9
2,966						
9,423						

Divisible by	2	3	4	5	6	9
5,845						
278						

35. Factor the following numbers to their prime factors.

<p>a. 22 /\</p>	<p>b. 65 /\</p>	<p>c. 48 /\</p>
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36. Find the greatest common factor of the given numbers.

a. 45 and 36

b. 40 and 200

37. Find the least common multiple for these pairs of numbers.

a. 3 and 7

b. 9 and 12

Fractions

38. If you can find an equivalent fraction, write it. If you can not, cross out the whole problem.

a. $\frac{5}{7} = \frac{\square}{34}$	b. $\frac{\square}{7} = \frac{8}{28}$	c. $\frac{9}{8} = \frac{56}{\square}$	d. $\frac{6}{11} = \frac{72}{\square}$
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39. Add and subtract the fractions and mixed numbers.

a. $\frac{2}{5} + \frac{5}{6}$

b. $\frac{8}{9} - \frac{1}{3}$

c. $5\frac{1}{4} - 1\frac{1}{3}$

d. $3\frac{6}{7} + 4\frac{1}{4}$

40. Compare the fractions, and write $<$, $>$, or $=$ in the box.

a. $\frac{2}{3} \square \frac{7}{11}$

b. $\frac{11}{13} \square \frac{4}{5}$

c. $\frac{56}{100} \square \frac{524}{1000}$

d. $\frac{3}{7} \square \frac{2}{5}$

41. Is the following multiplication correct?
If not, correct it.

$$\frac{2}{3} \times \text{circle} = \text{circle}$$

The first circle is divided into 6 equal sectors, with 4 sectors shaded green. The second circle is divided into 6 equal sectors, with 1 sector shaded green.

42. How many $1\frac{3}{4}$ -inch pieces can you cut from a string that is $33\frac{1}{2}$ inches long?

43. Solve. Give your answer as a mixed number and in a simplified form.

a. $\frac{5}{9} \times 4$	b. $\frac{6}{7} \div \frac{2}{5}$
c. $\frac{3}{8} \times \frac{12}{15}$	d. $5\frac{1}{2} \div 1\frac{11}{12}$

44. Dad used $\frac{1}{7}$ of his \$1,785 to pay for rent.
Of what was left, he used $\frac{1}{5}$ to pay a grocery bill.

- a.** How much was the grocery bill?
- b.** How much money does Dad have left now?

45. Of a chess club's members, $\frac{2}{5}$ are girls,
and the rest are boys. There are 18 boys.
How many members does the club have?

46. Mary's vegetable garden is $5\frac{1}{2}$ feet by $5\frac{1}{2}$ feet.

- a.** Find its area in square feet.
- b.** Find its area in square inches.

47. A 3-ft board was cut into two pieces that were in the ratio of 1:7.
How long is each of the pieces?

48. A rectangle with the sides of $2\frac{1}{4}$ in. and 2 in. is enlarged in a ratio of 2:3.

a. Find the lengths of the sides of the resulting larger rectangle.
(Optionally, you can also draw the rectangles.)

b. Find the area of the resulting rectangle.

Percent

49. Write as percentages, fractions, and decimals.

a. $\underline{\hspace{1cm}}\% = \frac{66}{100} = \underline{\hspace{1cm}}$	b. $3\% = \frac{\text{■}}{\text{■}} = \underline{\hspace{1cm}}$	c. $\underline{\hspace{1cm}}\% = \frac{\text{■}}{\text{■}} = 0.89$
d. $270\% = \frac{\text{■}}{\text{■}} = \underline{\hspace{1cm}}$	e. $\underline{\hspace{1cm}}\% = \frac{15}{1000} = \underline{\hspace{1cm}}$	f. $\underline{\hspace{1cm}}\% = \frac{\text{■}}{\text{■}} = 0.943$

50. Write as a percentage. Round your answers to the tenth of a percent.

a. $\frac{1}{7}$

b. $\frac{13}{20}$

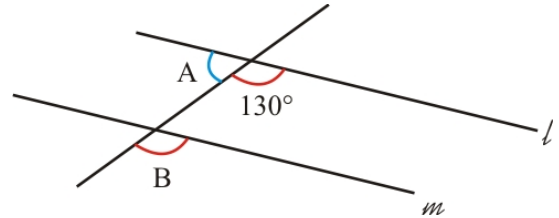
51. Jeans cost \$20, but the store increased the price by 20%.
What is the new price?

52. Tina's book bag contains 12 fiction books and 4 non-fiction books.
What percentage of the books are non-fiction?
53. Meredith is 160 cm tall. Jane's height is 90% of Meredith's height.
How tall is Jane?
54. How much does a \$5.40 lunch cost if it is discounted by 10%?
55. Arthur and Jim are babies. Arthur is 64 cm long and Jim is 80 cm long.
How many percent is Arthur's height of Jim's height?
56. A chess club had 15 members. Next year it has 20 members.
How many percent was the increase?
57. The rent was \$200, and then it was lowered to \$190.
What percent was the decrease?

Geometry

58. The lines l and m are parallel. One angle in the figure is marked as 130° . How many degrees are angles A and B?

A = _____ $^\circ$; B = _____ $^\circ$

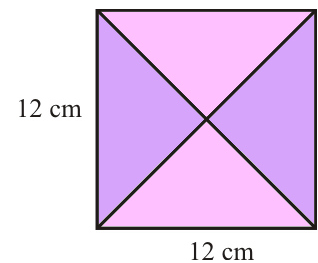


59. Two angles of a triangle measure 20° and 70° .

- Is the triangle acute, right, or obtuse?
- The side between the 20° and 70° angles measures 5 cm. Draw the triangle.

60. Mary is making a quilt using squares like the one on the right.
What is the area of one of the small triangles in square centimeters?

In square millimeters?



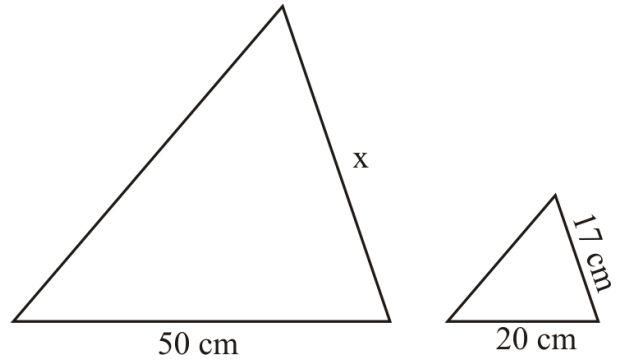
61. The radius of a circle is 6 units. Which of the following expressions will give you the area of the circle? You do not have to calculate the area.

- | | | | |
|-------------------|---------------------|--------------------|--------------------|
| a. 6π | b. $6\pi^2$ | c. 36π | d. 12π |
| e. $6/\pi$ | f. $6/\pi^2$ | g. $36/\pi$ | h. $12/\pi$ |

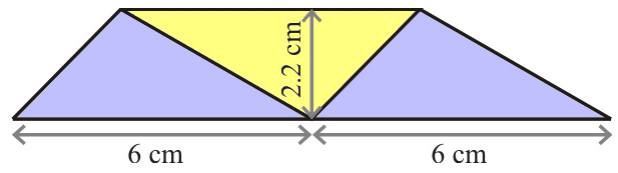
62. The radius of a circle is 10 cm. What is the circumference of the circle, to the nearest millimeter?

- | | | | |
|-----------------|------------------|------------------|-----------------|
| a. 31 mm | b. 314 mm | c. 628 mm | d. 63 mm |
|-----------------|------------------|------------------|-----------------|

63. The triangles are similar. Calculate the side length marked with “x”.

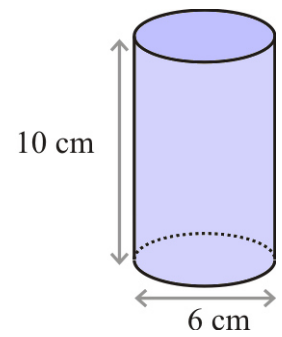


64. Find the total area of this shape.



65. Find the surface area of a cube with 3-cm sides.

66. Find the volume of this cylinder-shaped can.
Use 3.14 for Pi.

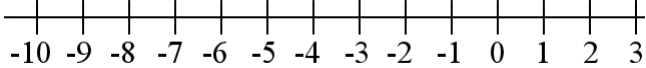


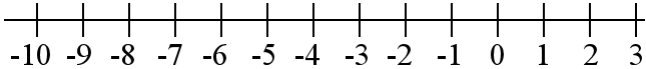
Integers

67. Order the numbers from the least to the greatest.

a. 7 0 -9 -7	b. -13 -23 -10 -3
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68. Draw a number line jump for each addition or subtraction sentence.

a. $-10 + 6 = \underline{\hspace{2cm}}$ b. $-5 + 7 = \underline{\hspace{2cm}}$ 

c. $-1 - 5 = \underline{\hspace{2cm}}$ d. $3 - 8 = \underline{\hspace{2cm}}$ 

69. Add and subtract.

a.	b.	c.	d.
$3 + (-8) = \underline{\hspace{2cm}}$	$(-6) + (-9) = \underline{\hspace{2cm}}$	$2 + (-9) = \underline{\hspace{2cm}}$	$4 - (-2) = \underline{\hspace{2cm}}$
$(-3) + 8 = \underline{\hspace{2cm}}$	$6 - 9 = \underline{\hspace{2cm}}$	$-6 - 5 = \underline{\hspace{2cm}}$	$-4 - (-2) = \underline{\hspace{2cm}}$

70. Multiply.

a. $-3 \times (-5) = \underline{\hspace{2cm}}$	b. $(-7) \times (-8) = \underline{\hspace{2cm}}$	c. $(-2) \times 3 \times (-2) = \underline{\hspace{2cm}}$
$-3 \times 5 = \underline{\hspace{2cm}}$	$7 \times (-9) = \underline{\hspace{2cm}}$	$-8 \times (-2) \times (-1) = \underline{\hspace{2cm}}$

71. Divide.

a. $-20 \div (-5) = \underline{\hspace{2cm}}$	b. $(-48) \div (-4) = \underline{\hspace{2cm}}$	c. $-72 \div 8 = \underline{\hspace{2cm}}$
$33 \div (-3) = \underline{\hspace{2cm}}$	$21 \div (-7) = \underline{\hspace{2cm}}$	$-150 \div (-10) = \underline{\hspace{2cm}}$

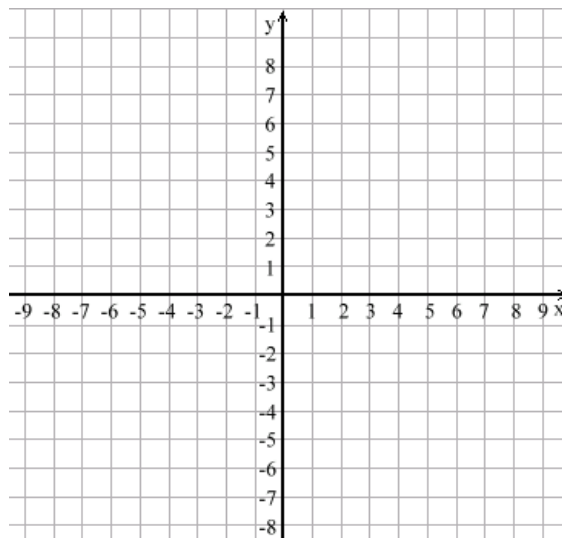
72. Find the missing numbers.

a. $-5 + \underline{\hspace{2cm}} = -10$	b. $2 \times \underline{\hspace{2cm}} = -14$	c. $3 - \underline{\hspace{2cm}} = -2$
d. $-48 \div \underline{\hspace{2cm}} = 6$	e. $4 + \underline{\hspace{2cm}} = 0$	f. $-1 - \underline{\hspace{2cm}} = -9$

73. Plot the points from the function $y = 2 - x$ for the values of x listed in the table.

x	-6	-5	-4	-3	-2	-1	0	1
y								

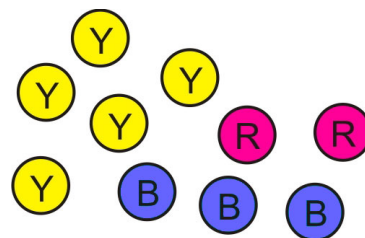
x	2	3	4	5	6	7	8	9
y								



Statistics & Probability

74. You pick randomly one marble from these marbles.
Find the probabilities:

- P(yellow)
- P(not red)
- (blue or red)



75. You pick randomly one marble, and put it back. Then you pick another marble.
Find the probabilities:

- P(blue; blue)
- P(not yellow; not yellow)

76. If possible, find the mean, median, and mode of the data sets.

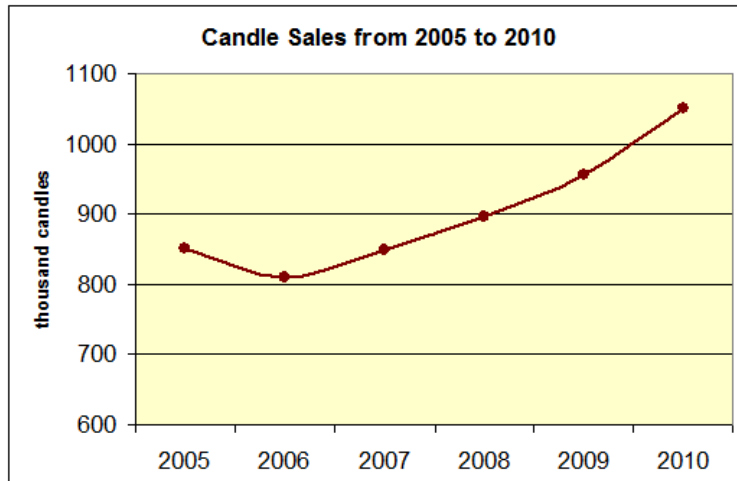
- blue, blue, blue, blue, red, red, green, yellow, yellow, yellow

mean _____ median _____ mode _____

- 6, 8, 10, 10, 10, 11, 11, 12, 13, 16

mean _____ median _____ mode _____

77. The line graph shows the number of candles that the candle factory sold in years 2005 to 2010. Note the scale is given in “thousand candles”.

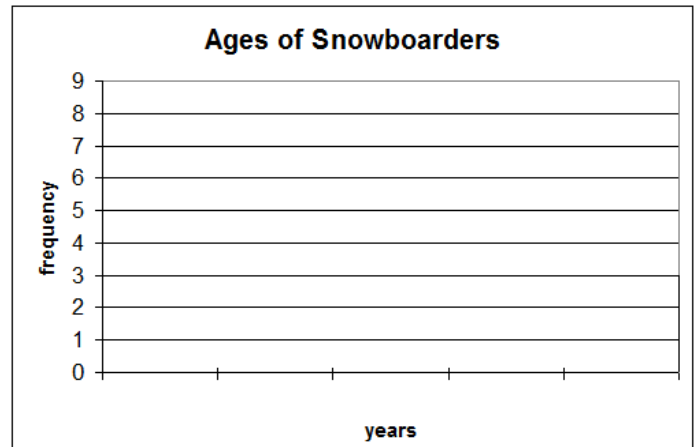


- Estimate from the graph about how many candles were sold in 2009.
- About how many more candles were sold in 2010 than in 2005?
- About how many percent was the increase from 2005 to 2010?

78. This data lists the ages of 24 snowboarders (in years). Make a histogram with five bins.

15 15 15 15 16 16 16 16 17 17 17 18
18 18 19 19 20 21 21 22 22 23 23 24

Age (years)	Frequency



79. A factory makes candles and packages them into boxes. The manager chose 15 boxes and counted the number of candles in them. The stem-and-leaf plot shows the data he got.

Stem	Leaf
2	9 9 9
3	0 0 1 2 3 3 4 4 5 5 8
4	0

- What is the median?
- What is the range?

4 | 5 means 45