

**GRADE 12 ESSENTIAL QUESTIONS
SOME SELECTED PRACTICE PROBLEMS
THERE WILL ALSO BE SOME MULTIPLE CHOICE
THERE WILL ALSO BE SOME PROBLEM SOLVING (Unit A)**
Some of these problems are copied from some of the Manitoba Archived exams, check out that site for full solutions, exemplars, and even more past exams!

*Manitoba Education and Advanced Learning School Programs Division Winnipeg,
Manitoba, Canada*

Permission was given to reproduce some of the questions in this document for non-profit educational purposes provided the source was cited: "Manitoba Education and Advanced Learning."

DIRECTIONS FOR A TEST

(This is just a workbook thought! Not hand-in)

- ◆ Show complete answers in the space(s) provided on a test. In this workbook there is likely not enough room! Use your own paper for this workbook.
- ◆ Let the mark values for each question guide you in answering the question.
- ◆ Show all your work on a test so you can get part marks and to organize your thoughts.
- ◆ Be sure to include units in your final answer.
- ◆ Use your Formula Sheet and your study sheet.
- ◆ Provide explanations and justifications.
- ◆ Use a well-organized method to communicate your answer. I.e: Label steps, label calculations, box answer(s), write answer in words,

The Meaning of Directing Words on Tests

| | |
|---------------------|--|
| identify/choose | the appropriate answer(s) from a given list of choices |
| state | a word, sentence, or number, without an explanation |
| describe/explain | words or symbols, diagrams, charts or graphs, or other methods that clearly show what you are thinking |
| justify/support | an explanation, information, or evidence that shows why your method, idea, or answer is correct |
| sketch | a reasonably neat picture or diagram (not necessarily to scale) that shows or explains an idea, concept, or method |
| calculate/determine | a mathematical formula, an algebraic equation, or a numerical calculation to solve a problem |

HOUSE FINANCE

1. Chris buys a house in Carman for \$225 000. The bank offers him a mortgage interest rate of 4.75% amortized over 25 years.

A) Chris makes a 10% down payment. Calculate the amount that Chris needs to borrow from the bank for his mortgage.

B) Calculate the monthly mortgage payment.

| Amortization Period of Mortgage Loan When Paid Monthly (Blended payment of principal and interest per \$1000 of loan) | | | | | |
|--|---------|----------|----------|----------|----------|
| Interest Rate | 5 years | 10 years | 15 years | 20 years | 25 years |
| 4.00% | \$18.40 | \$10.11 | \$7.38 | \$6.04 | \$5.26 |
| 4.25% | 18.51 | 10.23 | 7.50 | 6.17 | 5.40 |
| 4.50% | 18.62 | 10.34 | 7.63 | 6.30 | 5.53 |
| 4.75% | 18.74 | 10.46 | 7.75 | 6.44 | 5.67 |
| 5.00% | 18.85 | 10.58 | 7.88 | 6.57 | 5.82 |
| 5.25% | 18.96 | 10.70 | 8.01 | 6.71 | 5.96 |
| 5.50% | 19.07 | 10.82 | 8.14 | 6.84 | 6.10 |

Ans: \$202 500; \$1148.18

2. Determine the monthly payment for a mortgage of \$235 000 at an interest rate of 4% for a period of 25 years.

ANS: \$1236.10

3. State two factors that may increase or decrease a homeowner's insurance premium.

5. Lorenzo wants to buy a house. His monthly property taxes will be \$125, his monthly heating costs will be \$160, and his monthly mortgage payment will be \$1216. He has a gross income of \$38 400 per year.

A) Calculate his Gross Debt Service Ratio (GDSR) as a percent.

B) Explain if his loan application will be approved based on the GDSR calculated in Part A.

Ans: 47% or 0.47; His GDSR is over 32%, so it will probably not be approved.

6. Betty bought a house for \$185 000. She already knows that for the first \$150 000 the land transfer tax will cost \$900. Calculate the total land transfer tax.

| Value of Property | Rate |
|--|------|
| On the first \$30 000 | 0% |
| On the next \$60 000 (i.e., \$30 001 to \$90 000) | 0.5% |
| On the next \$60 000 (i.e., \$90 001 to \$150 000) | 1.0% |
| On the next \$50 000 (i.e., \$150 001 to \$200 000) | 1.5% |
| On amounts in excess of \$200 000 | 2.0% |

Ans: \$1425

7. Sacha recently purchased a new house with a 20-year mortgage of \$174 000. Her monthly mortgage payment is \$1096.20.

A) State the total amount that Sacha will have repaid to the bank at the end of the mortgage.

B) State the total amount of money paid in interest to the bank over the life of the mortgage.

Ans: \$263 088 ; \$89 088

8. A home has a portioned assessment of \$160 000 and a frontage of 50 feet. The municipal tax rate is 23.01 mills. The education taxes are \$1171.20. Local sewer improvements are assessed at \$6 per foot. Calculate the total taxes due if the provincial property tax credit (money the province credits you and pays for you) is \$750.

Ans: \$4402.80

9. A property has a portioned assessment of \$120 000 and has 60 feet of frontage. The municipal mill rate is 13.01 mills. There is a special lighting levy of \$3.50 per foot of frontage. Education taxes are \$1903.20 and there is a Provincial Property Tax Credit of \$750. Calculate the total taxes due for this property.

Ans: \$2924.40

10. Explain why the insurance premium would be lower for tenant's insurance rather than homeowner's insurance for the same property.

10a. State three things that property taxes pay for.

PROBABILITY

11. The probability of Billy scoring a basket is 6 out of 8. State Billy's success rate as a fraction and as a percent.

Fraction: _____
Percent: _____

12. State the probability of "two out of five" as a decimal number and as a percent.

decimal number: _____
percent: _____

Ans: 0.4 ; 40%

13. Jonas is experimenting with pulling blocks out of a bag. There is an equal number of red blocks, yellow blocks, and blue blocks.

A) State the theoretical probability of pulling out a yellow block.

B) After repeating the experiment several times, Jonas pulled a red block 7 times, a yellow block 3 times, and a blue block 2 times. State the experimental probability of pulling a yellow block.

Ans: 0.33 or 33% or $\frac{1}{3}$; 0.25 or 25% or $\frac{1}{4}$

14. It would cost \$1000 for a contractor to bid on a construction project. There is a one in four chance that she will win the contract. If she is awarded the contract she will be paid \$3000 for the work.

A) Calculate the expected value.

B) Justify whether she should bid on the contract based on the expected value calculated in Part A.

Ans: – \$250 ; No, the expected gain is negative, therefore, she should not bid on the project

15. The probability that John will get a construction contract is 0.33. It will cost him \$25 000 to prepare his bid and, if he gets the contract, it will be worth \$100 000.

A) Determine his expected value.

B) Justify whether he should bid on the job, based on your answer in Part A.

Ans: \$8000; He should bid on the job because there is a positive expected value

17. The weather forecast states that there is a 30% probability of rain for tomorrow. State the **odds against** it raining tomorrow.

Ans: 70 : 30 or 70 to 30 or better yet 7 : 3

Explain the difference between odds and probability

Ans: *probability compares favourable outcomes to total number of outcomes; odds compare desired outcomes to non-desired outcome – odds can be greater than 1 and probability cannot*

18. The City of Selkirk is planning a Fun Day.

A) The probability of it raining on Fun Day is $\frac{3}{24}$. State the odds that it will not rain on Fun Day

B) The odds for winning a prize at Fun Day are 2 : 1. State the probability of winning a prize.

Ans: 21 3 or 21 to 3; 67% or 0.67 or two out of three or 2 3

19. Erwin is a farmer in rural Manitoba. There is an equal probability that a farmer in Erwin's area will plant one of two crops: wheat or canola. Erwin surveys 10 farmers in the area and finds out that 7 of them plan to plant wheat.

- A) State the theoretical probability that a surveyed farmer will plant wheat.
 B) State the experimental probability that a surveyed farmer will plant canola.

Ans: 0.5 or 50% or $\frac{1}{2}$; 0.3 or 30% or 3 out of 10 or $\frac{3}{10}$ ths

20. A fair six-sided cube numbered from 1 to 6 is rolled. State the probability that a 4 or less (1, 2, 3, or 4) will be rolled.

Ans: 0.67 or 67% or $\frac{2}{3}$

VEHICLE FINANCE

21. Tyson has a job that requires a vehicle for out-of-town travel. On average, he drives at least 3000 km per month. State one advantage and one disadvantage of leasing a vehicle.

22. Bonnie wishes to buy a new vehicle from a Manitoba dealership for \$16 200 before taxes. She has \$5000 saved for a down payment.

- A) Calculate the amount Bonnie needs to borrow to purchase the vehicle.
 B) Bonnie can get a loan for 4 years at 5.5%. Calculate the amount of her monthly payments

Ans: \$13 306 ;

23. Tom decides to buy a new car in Manitoba for \$32 400. He adds a tow package to the car for \$3000. The freight is \$650. The dealership gives him \$12 000 for his old car. Calculate the cost, including taxes, of purchasing the new vehicle

Ans: \$27 176.50

24. Mary borrows \$18 500 from her bank to purchase a car. The bank offers her an interest rate of 6.75% for 4 years.

- A) Calculate the monthly payment.
 B) Calculate the total amount of interest paid over the life of the loan.

Ans: \$440.86 ; \$2661.28

25. A car travels 2400 km and consumes 200 L of fuel. Calculate the fuel economy in L/100 km for the car.

Ans: 8.33L / 100 km

26. Tom's vehicle uses 12.8 L of fuel for every 100 km driven. The cost of fuel is \$1.20/Litre. Calculate the cost of fuel for Tom to drive 3000 km.

Ans: \$460.80

27. A brand new car costs \$26 800 **before taxes**. It will depreciate 15% in the first year.
 a. Calculate the value of the car after the first year.
 b. Calculate the value of the car after 3 years if it depreciate 15% from the preceding years

Ans: a. \$22,780 ; b. \$16,458.55

30. Sylvie takes her car in for a seasonal maintenance checkup at a Manitoba dealership. In addition to the basic \$60 fee, Sylvie gets an oil change for \$50, and a new set of brake pads for \$80. The mechanic spends 1.5 hours working on the vehicle at a rate of \$90 per hour. Calculate Sylvie's total bill, after taxes. (PST 8% and GST 5% apply to everything including labour)

31. Robert took his vehicle in for servicing at a Manitoba dealership. The dealership charged \$90 per hour for labour. The servicing took 1.5 hours to complete. Two (2) windshield wipers were replaced at a cost of \$12 each. Four (4) winter tires were put on at a cost of \$120 each. Calculate the total cost, including taxes (8%? and 5%), of the servicing.

Ans: \$722.07?

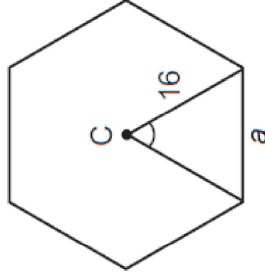
GEOMETRY AND TRIG

32. Determine the number of diagonals in a regular octagon.

Number of diagonals: _____

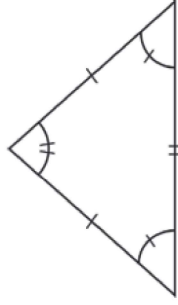
33. Given a regular hexagon with centre C:

- a. Determine the measure of the central angle of the hexagon
 - b. Determine the length of side a.
- Justify your response.



- 35. A regular polygon has central angles of 45° .
 - A) State the number of sides for this polygon.
 - B) State the name of this polygon.

36. Choose the letter that best completes the statement below. The triangle at right is:



- a) scalene
- b) equilateral
- c) isosceles
- d) right

Answer: _____

Ans c: **isosceles**

37. Choose the letter that best completes the statement below. An isosceles triangle must have

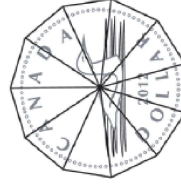
- a) a right angle
- b) two sides of the same length
- c) all angles with different measures
- d) all acute angles

Ans: b

38. Determine (by illustration or calculation) the total number of diagonals in a regular six-sided polygon.

ANS: There are 9 diagonals.

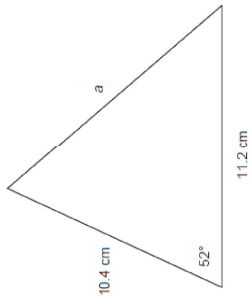
40. A coin is in the shape of a regular polygon with 11 sides. State the measure of a central angle in degrees.



Ans: 32.7°

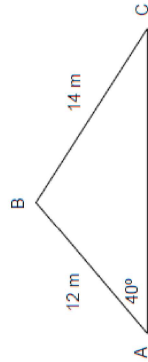
41. State an example from the construction, commercial, industrial, or artistic industries where a certain degree of tolerance is required. Support your example with an explanation of how tolerance was required.

42. Given the triangle at right, calculate the length of side a in centimetres.



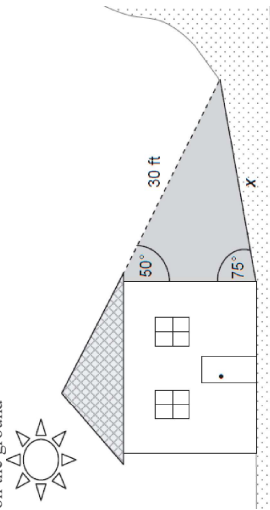
Ans: $a = 9.5$ cm

43. Given the triangle below, calculate the measure of angle C , in degrees.



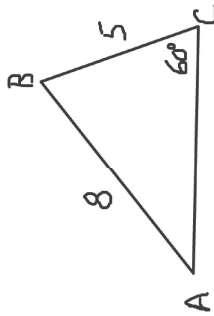
Ans: angle $C = 33.4^\circ$

44. A building is on the side of a hill. Calculate the length of shadow (x) the building will cast on the ground



Ans: $x = 23.8$ ft

44a. Solve the triangle completely (find the other three parts). Round angles to nearest whole degree



Ans: $\angle A = 32.76^\circ$ (33°) ; $\angle B = 87.24^\circ$ (87°); side $b \approx 9.23$ units

PRECISION MEASUREMENT

45. An odometer is used to measure the distance a car travels. The trip odometer reads 947.2 km. State the precision and uncertainty of the odometer.

Precision: _____
 Uncertainty: _____

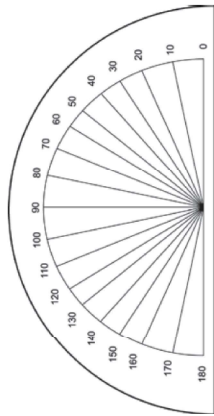
46. A metre stick is left outside in the sun and it expands. Explain how this will affect the stick's accuracy and precision.

Accuracy: _____
 Precision: _____

47. The width of a door frame has a nominal value of 36 inches (which is halfway between the minimum and maximum value). The tolerance is 0.5 inches. State the minimum and maximum values of the width of the door frame.

Maximum: _____
 Minimum: _____

48. State the precision and uncertainty of the protractor.



Ans: 10°, 5°

49. Cailyn works as a production engineer. She is working with a machine part that has a tolerance of 0.04 mm and a nominal value of 0.50 mm which is halfway between the maximum and minimum values. State the maximum and minimum values of the machine part.

Maximum: _____
 Minimum: _____

50. Explain why a timer for a 100 m race would need to be more precise than a timer for a 10 km run.

Ans: The runners' times will be closer; smaller unit of measurement required

51. The length of a school's garden is measured using a stick that has been cut to 1 metre in length. State the uncertainty in the measurements made using the stick.

Ans: 0.5 m

52. Describe a measurement situation and explain why a certain degree of accuracy would be required.

55. A company manufactures cylinders that must have a mass of 4.82 kg, within a tolerance of 0.24 kg.

- A) State the minimum mass.
- B) State the maximum mass.

Ans: 4.70 kg; 4.94 kg

56. The maximum amount of stuffing that can fit in a pillow is 1500 grams. The tolerance is 100 grams. State the nominal value (which is halfway between the minimum and maximum values).

57. Given the following scores from a Grade 12 Biology class:

| | | | |
|----|----|----|----|
| 61 | 80 | 87 | 54 |
| 40 | 86 | 61 | 68 |
| 54 | 72 | 54 | 87 |

- A) State the mean.
- B) State the mode.

Ans:

60. Three hundred (300) students wrote a math exam. Craig scored 78% on his math exam. Calculate Craig's percentile ranking, if 204 students received a lower score than him.

61. The data below shows the amount of snow that fell during a 7-day period in Springfield, Manitoba.

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|--------|--------|---------|-----------|----------|--------|----------|
| 2cm | 0cm | 1cm | 12cm | 4cm | 0cm | 3cm |

- A) State the median daily snowfall for the period.
 B) State the mode of daily snowfall for the period.

Ans: 2 cm; 0 cm

62. Mrs. Themark's class of 10 students had the following results (as percents) on a recent unit test:

| | | | | |
|----|----|----|----|----|
| 10 | 65 | 75 | 82 | 90 |
| 57 | 67 | 78 | 83 | 91 |

- A) Mrs. Themark wants to determine the class average by calculating the trimmed mean, by removing the highest and lowest result. Calculate the trimmed mean.
 B) Explain why the mark of 10% could be considered an outlier.

Ans: 75%

65. Jody and Carol play on two different basketball teams. They were both ranked for points scored on their teams.

- Jody ranks in the 90th percentile on her team.
- Carol ranks in the 75th percentile on her team.

Explain whether it can be determined which player scored more points.

66. Fifty (50) members of a football team are weighed. Thomas weighs 165 pounds. Four (4) players weigh less than Thomas.

- A) Calculate Thomas's percentile rank.
 B) Explain how Thomas's weight compares to the weight of the other team members.

Ans: 8 or 8th or P₈
 67. Taitiana is enrolled in a law class. The following table shows the average marks she earned and the weight for each category.

| Category | Average Mark | Weight |
|-------------|--------------|--------|
| Assignments | 90 | 10% |
| Tests | 65 | 60% |
| Final Exam | 80 | 30% |

Using a weighted mean, calculate Taitiana's final mark in the course.

Ans: 66%

70. A game of dice involves rolling a single fair six-sided die. You pay nothing to roll! If you roll a six you win \$10. If you roll any other number you pay \$2.00.

- a. calculate the expected value of this game; and
 b. determine much money you expect to win if you play this game 40 times?

Ans: a. $EV = 0$,
 b. expect zero profit, you can play all day and expect to average out with zero winnings, it is a fair game.

PROBLEM SOLVING

100. 8 years ago the teacher was twice my age, I am 32 now. How old is the teacher now?

Ans: 56 years

101. Dave buys a table and 4 chairs for \$220. Gracie buys the same table and 6 of the same chairs for \$270. Determine the price of a chair. Determine the price of the table.

Ans: \$120, \$25

102. The second of two numbers is 6 times the first. Their sum is 84. Determine the two numbers.

Ans: {12, 72}

103. The larger of two numbers is 9 more than the smaller. Their sum is 95. Find the numbers.

Ans: {43, 52}

105. A Math teacher drove past a farmyard full of chickens and pigs. The teacher noticed that there were a total of 30 heads and 100 legs. How many pigs were there?

Ans: 20 pigs

106. A burglar trying to escape police got on an elevator in a tall building. He went up 8 floors, down 4 floors, up 3 floors, down 7 floors, and down 2 more floors. He finished at Floor 20. At what floor did he start?

Ans: 22

107. A subway train left downtown with 121 passengers aboard. At the first stop, 1 person got off. At the second stop, 3 people got off. At the third stop, 5 people got off. At the fourth stop, 7 people got off. If that pattern continues,

- A) how many people got off at the 7th stop?
- B) how many stops will the train have made when all the passengers are off and it is empty?

Ans: 13 at 7th stop, 11 stops till empty

108. Tom made a New Year's resolution to stop spending all his money. He has a plan. During January, he will save \$1. During February, he will save \$3. During March, he will save \$5. During April, he will save \$7. If he continues to follow this plan, \$ how much money will he save altogether in one year?

Ans: \$144

110. Today is the teacher's birthday. The teacher said: "If you multiply my age by 3, then subtract 20, the result is 100." How old is the teacher?

Ans: 40

120. Solve using a table (or any other method)

You and eight friends are driving west for a Sun Dance in Calgary. You are taking two cars. Your friends start an hour earlier than you at 9 am and travel at a speed of 100 km/hr. You depart (the hour later at 10 am) and travel at a speed of 110 km/hr. At what time will you catch up with them? (Show work).

Here is the format of a table you *may* want to use

| | | | | | | | | |
|--------------------|-------|-------|-------|--|--|--|--|--|
| Time | 09:00 | 10:00 | 11:00 | | | | | |
| Distance First car | 0 | 100 | 200 | | | | | |
| Distance Your Car | | 0 | 110 | | | | | |

Ans: 8 PM (ie: 20:00)

122. Determine the sum of the numbers from 1 to 42

123: Solve the following equations:

a) $3x + 2 = 35$ b) $\frac{x}{4} - 7 = 0$

c) $3x + 2x = 25$ d) $\frac{x}{9} + 3 = 8$

a) $x = 11$ b) $x = 28$ c) $x = 5$ d. $x = 45$

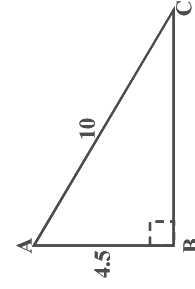
MULTIPLE CHOICE PRACTICE

Circle the letter of the **best** or **closest** answer
Each multiple choice question is worth **2 marks**.
Diagrams are not necessarily drawn to scale.

- Which activity is an activity *not* paid for by the city (or municipal government if in a rural area)?
 - libraries
 - snow clearance
 - fire department
 - schools
- What portion percentage (weight factor) is applied to the assessed value of **residential property** when the City of Winnipeg or any community in Manitoba calculates property taxes?
 - 45%
 - 20%
 - 100%
 - 0%
- The probability of rolling two fives (double fives) with a pair of fair 6-sided dice is:
 - $\frac{1}{6}$
 - $\frac{1}{36}$
 - 35 : 36
 - 55%
- If the expected value of each play of a game is: **-\$1.50**, how much can you expect to win or lose if you play **20** times?
 - lose \$7.50
 - win \$17.50
 - lose \$30
 - break even most of the time
- How many ways can you set four *different* bingo dabbers in a row if the single blue one has to be on the left?
 - 3
 - 6
 - 4
 - 24

6. A **frontage levy** for property taxes is calculated based on:
- the width of your property
 - the assessed value of your house
 - the number of occupants
 - the interest rate of your mortgage
7. 14 is what percent of 56?
- 25%
 - 4%
 - 56.14%
 - $\frac{1}{4}\%$
8. If Jayson drives 4200 km and uses 396 L of gas, what was his vehicle's fuel economy in L/100 km?
- 10.6 km per litre
 - 10.6 L/100 km
 - 9.4 L/100 km
 - 0.09428
9. A box contains four blue marbles, six yellow marbles, and two **green** marbles. The probability of drawing a **green** marble is:
- 2
 - 17%
 - 60%
 - $\frac{1}{3}$

10. If the **probability** of some event happening is 60% then the **odds in favour** of the event happening are:
- $\frac{3}{5}$
 - 3 : 2
 - 60 : 1
 - 40%



11. The length of side **a** is:
- 80 units
 - 8.93 units
 - 10.97 units
 - 4.5 units

12. The measure of angle B:



- 4.61 units
- $5 \cdot \sin(b)$
- 70°
- 50°

13. A local factory makes widgets. The quality assurance department has determined that 3% of the widgets are defective. If the factory makes 12,000 widgets, how many can be expected to be defective?

- 3600
- 360
- 4,000
- 400

14. The cosine law of trigonometry is used:

- when two sides and an included angle are known, **or** when all three sides are known across from a known angle
- when a known angle and its known side opposite are used to find an unknown side
- only when the triangle has a right angle in it
- to find the median of a triangle

15. A mean of some number of measured variables x is calculated by:

- arranging the x amounts in order and finding the middle one
- finding the x amount that happens the most frequently
- find the x amount that happens the least frequently; add 1 and divide by 2
- summing all the x amounts and dividing by the number of x 's

16. Testing a car for the safety of occupants in a crash is best accomplished by using:
- a theoretical probability of injury
 - an expected value of the injuries
 - an experimental probability of injury
 - a random guess at the likelihood of injury
17. A useful formula for finding an angle, $\angle A$, in any triangle ABC where all three sides are known lengths; is:
- $a^2 = b^2 + c^2$
 - $2\pi r^2 + 2\pi r h$
 - $\angle A = \cos^{-1} \left(\frac{b^2 + c^2 - a^2}{2bc} \right)$
 - $\frac{a}{\sin A} = \frac{b}{\sin B}$
18. Kim's afternoon English class has **16 students**, Rick's afternoon Math class has **24 students**. There was a vote to see if classes should be cancelled on Friday. **35%** of the English class voted Yes, **85%** of the Math class voted Yes. Combining the two classes as a proper **weighted mean** the percentage of all the surveyed students voting 'Yes' is:
- 76%
 - 65%
 - 60%
 - 120%