Mathematics Education , Reform Curriculum and Statistics for High school using Technology (Classwiz) in Cambodia

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Curriculum Development in Cambodia

Education System

1980-1986 Education system 10 years (4+3+3)

1986-1994 Education system 11 years (5+3+3)

1994-Present Education system 12 years (6+3+3)

The current curriculum was a result of the 1996 core curriculum and the curriculum policy 2005-2014 which was written by MOEYS committed.

It was synthesis of the curriculum in 1958, 1967, 1980, 1986, 1996, 2004 and other developed countries inside and outside the region.

Mathematics Education in Cambodia

Objectives of Mathematics Education

- Strengthen and widen students' knowledge
- Upgrade students' skills both morally and mentally
- Improve and solve problem most often met
- Relate math to technological science
- Continue study to higher level
- Help encourage students to take responsibility for their own duties

Expect Result

Student can be

- Use the concepts and techniques of Mathematics
- Formulate mathematical ideas property
- Consider reasonably
- Analyze and synthesize problems
- Solve problems of everyday life
- Use math to study other subjects

Mathematic curriculum for Primary Student

Objective of Mathematics for primary Level

After finish primary education students should have achieved the following

Objectives:

1. Obtain knowledge, Comprehension and concepts of basic mathematics
2. Calculate correctly and rapidly
3. Think logically
4. Show a positive attitude toward mathematics
5. Apply knowledge, Comprehension and concepts to solve mathematical
   problem in their daily lives.

Time allocation for the primary mathematics

- The National Curriculum Will be taught for 38 weeks Per year
40 minutes per lessons

Mathematics	Nº of Hours
Grade 1	7
Grade 2	7
Grade 3	7
Grade 4	6
Grade 5	6
Grade 6	6

Content Areas

1. Number
2. Measurement
3. Geometry
4. Algebra
5. Statistics

Description of the contents

1. Number: Study whole number and numerals Khmer and Hindu-Arabic notation, place value of whole numbers up to more than 1,000,000 Rational
   Numbers study fraction, decimal, percent and ratios and proportion.
2. Measurement: Study length, Mass, and Capacity Measurement time and Money
3. Geometry: Study plan geometry, geometric figures (square, rectangle, Triangle
   circle, quadrilateral and polygon). Solid geometry, geometrics shapes, (cube
,prism, pyramid, cylinder, cone and square)
4. Algebra: study algebraic expressions find the value of an algebraic expression
   by substitution.
5. Statistics: Read and interpret graphs and chart that is picture, graph, bar chart,
   line graphs, pie charts.

Mathematic Curriculum for lower secondary students

Objectives of Mathematics for lower secondary level

After finishing lower secondary education students can

1. Get concepts and skills of basics mathematics
2. Make computations correctly and quickly
3. Thinks reasonably
4. Apply their math knowledge and skill to technological science as well as solution to problems they meet frequently
5. Apply it the study of other subjects

Time allocation for lesson mathematics

The national Curriculum
Will be taught for 38 weeks
Per year
. 50 minute per lessons

Mathematics	N^0 of Hours
Grade 7	6
Grade 8	6
Grade 9	6

Content Areas

1. Number
2. Measurement
3. Geometry
4. Algebra
5. Statistics
6. Probability

Description of the contents

1. Number: students recognize the necessity and use of whole Number fraction, decimal, integers, rational numbers, percent, ratio and proportion and students can use calculator.
2. Measurement: study standard units and non standard units of Length Mass, and Capacity measurement. Operation on the time speed and understand distance using maps and scale.
3. Geometry: study perimeter and area of geometrics figure and surface area, volume of a solid, angle, quadrilaterals, circles, congruence and similarity triangles, Pythagoras' theorem.

   Algebra: Study algebraic expression, equations, coordinates of a point in a plane, linear equation in one variable and graph, line graphs, frequency table, Finding Mean, Median, Mode and Probability.

Mathematic Curriculum for Upper Secondary students

Purpose of upper secondary education

The purpose of upper secondary education are to prepare students for the Study in higher education and to equip students with knowledge and skill required in the labor market.
This upper secondary program in designed to serve these purpose by providing two stream "Social Science " and " Science"

Objectives of Mathematics for Upper Secondary level

1. Strengthen and extend students ’ knowledge to be more comprehensive and with proper rule.
2. Provide students with basic knowledge and skill for future study in higher level
3. Develop students ‘ proper thinking skill
4. Extend students ‘ creativity through mathematics study
5. Allow students to apply mathematics knowledge in solving real problem

3. Allow students to relate mathematics to science and technologies
3. Allow students to use mathematics for study of other subjects
4. Enable students to have management capacity, be responsible for their activities and decisions and be self-confident.

Time allocation

The National Curriculum Will be taught for 38 weeks Per year
50 minutes per lessons

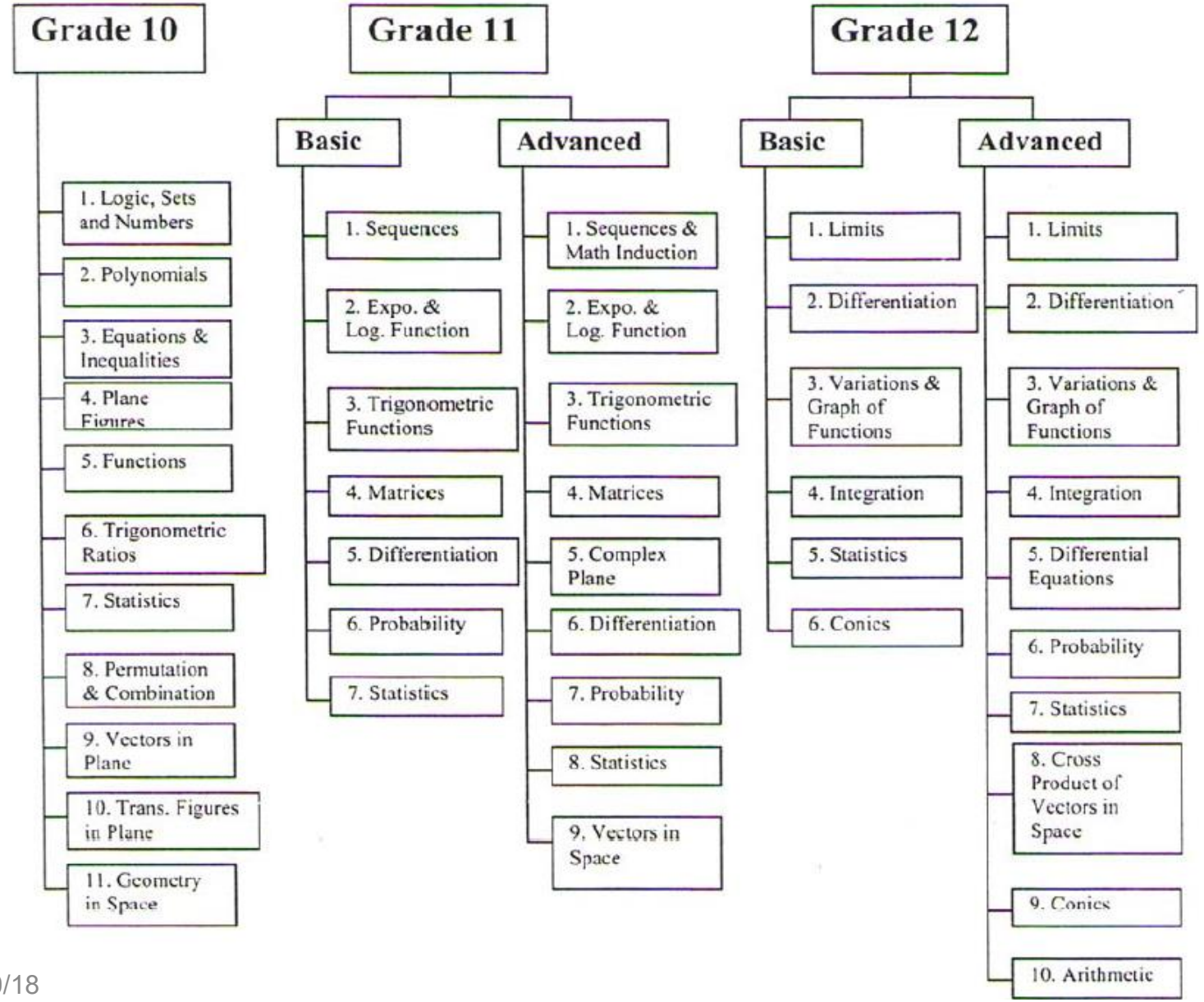
Mathematics		Nº Hours
Grade 10		6
Grade 11	Science	5
	Social Science	3
Grade 12	Science	5
	Social Science	3

Content Areas

The mathematics curriculum at upper secondary level consists of the following Sub-subjects:

- Arithmetic
- Algebra
- Analysis
- Trigonometry
- Plan and solid geometry
- Probability and statistics
- Conics

Framework of contents in Social science and Science of Mathematic



Learning Outcome and Social Science Mathematics Contents in Grade 10
Statistics allow students to study (10 Hours)

1. Collect , Classify , and tabulate statistical data

2. Construct bar chat , dot diagram , Histogram and frequency polygons.

(Find Mean , Median and mode of distribution of data in Particular situations)

Learning Outcome and Social Science Mathematics Contents in Grade 11
Statistics allow students to study (16 Hours)

1. Finding Range , Quartile , Deciles , Percentile , Variance and Standard deviation of a distribution of data in the particular situation
2. Interpreting data by graphs

Learning Outcome and Social Science Mathematics Contents in Grade 12
Statistics allow students to study (26 Hours)

1. Identify the concept of statistics of two variables and represent it by graphs
2. Find equation of linear regression and correlation coefficient and use them to interpret relation between these variables
3. Discover the relationships between two separate quantities and derive the conclution.

Learning Outcome and Science Mathematics Contents in Grade 12
Statistics allow students to study (26 hours)

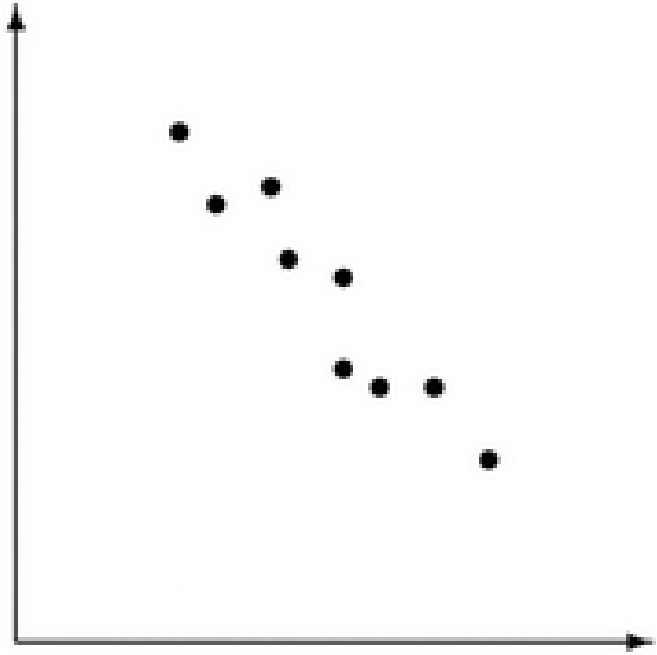
1. Identify the concept of statistics of two variables and represent it by graphs
2. Find equation of linear regression and correlation coefficient and use them to interpret relation between these variables
3. Discover the relationships between two separate quantities and derive the conclution.

Ex: Correlation between Mathematics and Physics score of 20 students who have taken exam in grade 12

Collections

7. Statisitics

Which of the following correlation coefficients (r) best matches the scatter diagram?



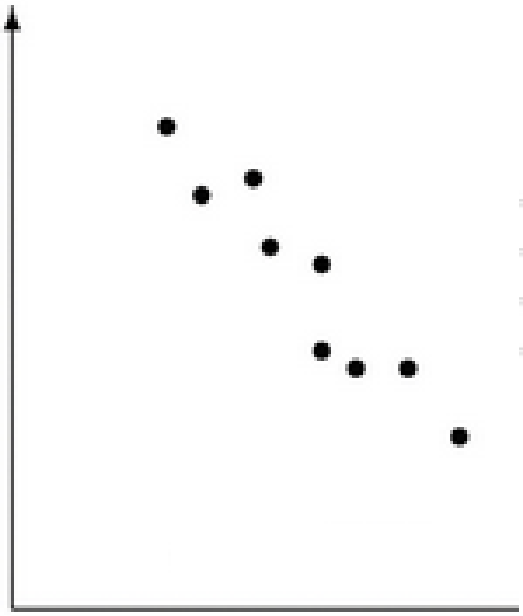
A -0.94

B 0.9

C -0.3

D -9.1

Which of the following correlation coefficients best matches the scatter diagram?



A -0.94

Strong, negative linear correlation between the two variables

B 0.9

This would be strong *positive* linear correlation

C -0.3

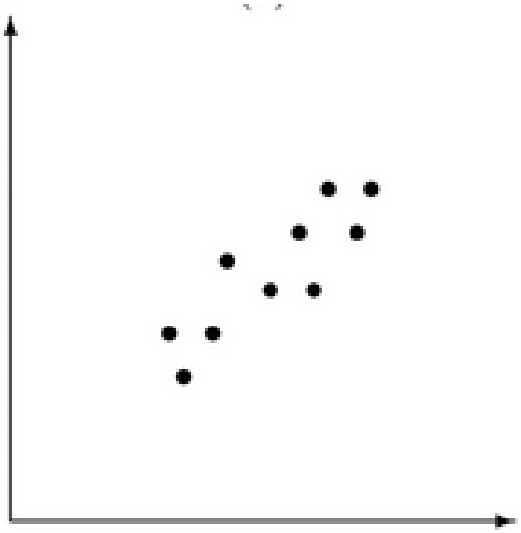
This would be *weak* negative linear correlation

D -9.1

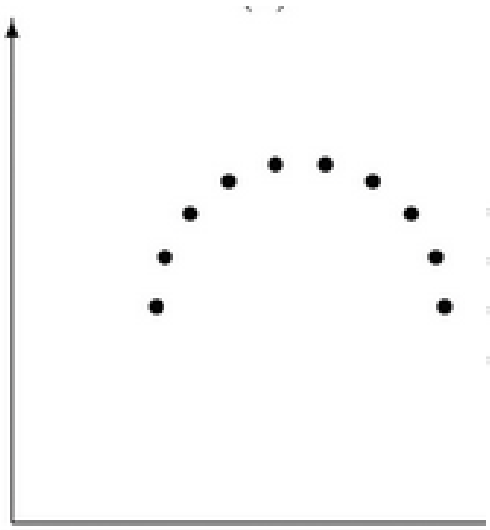
This is smaller than -1, so is not a valid correlation co-efficient

Which of the following scatter diagrams would have a correlation coefficient (r) closest to zero?

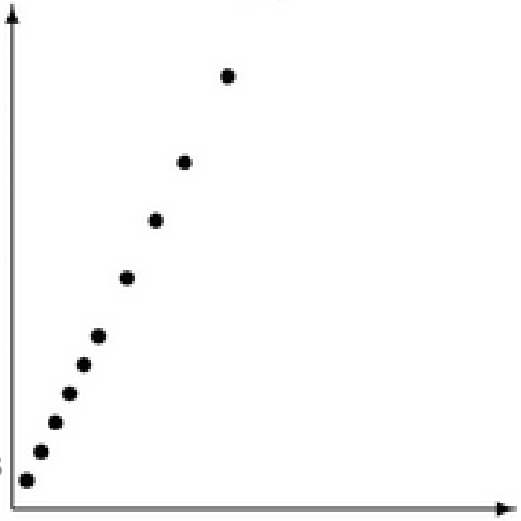
A



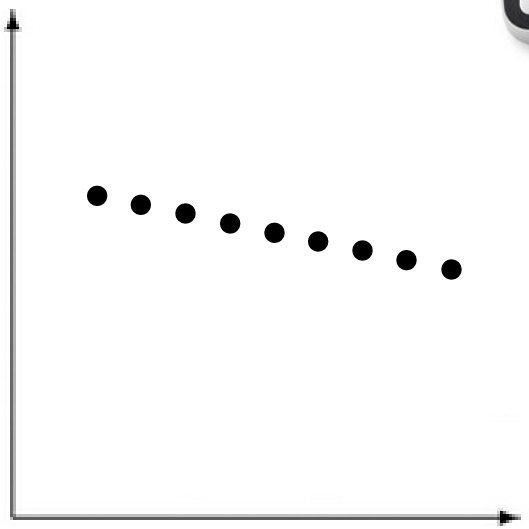
B



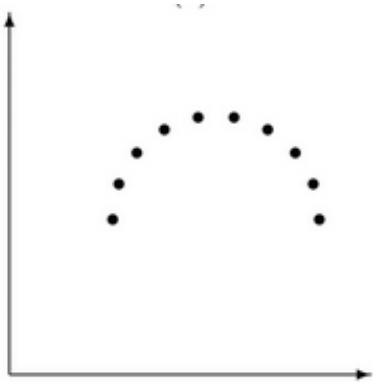
C



D

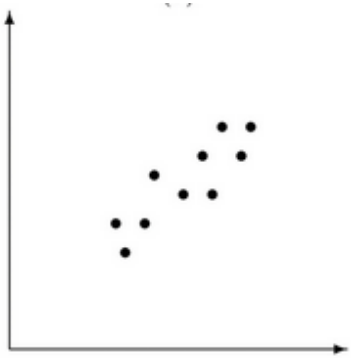


Which of the following scatter diagrams would have a correlation coefficient closest to zero?



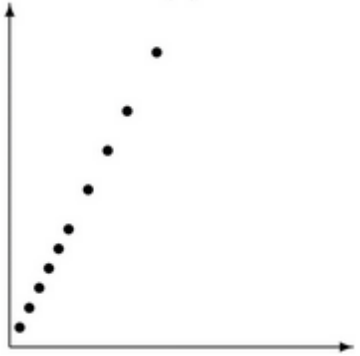
B

Whilst there is clearly a relationship between these variables, there is no linear correlation, which is what the correlation coefficient measures



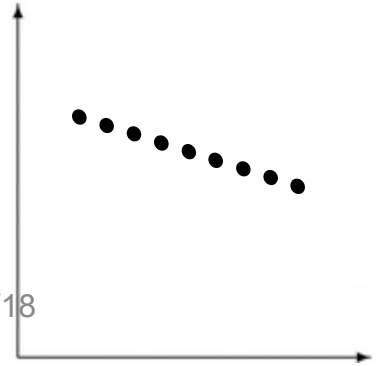
A

This would be strong *positive* linear correlation, and therefore have an r value of about 0.8



C

This is perfect positive correlation, and therefore would have an r value of 1

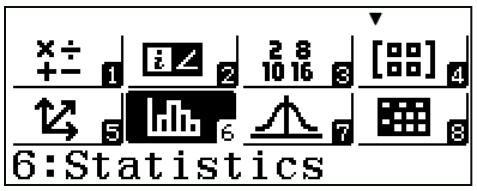


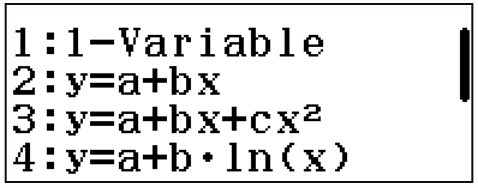
D

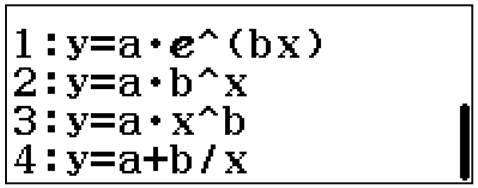
Despite the gradient, this is perfect negative linear correlation, and therefore would have an r value of -1

Using a calculator, work out the value of the correlation coefficient (r) for the following data:

Maths Score	19	16	8	12	20
Science Score	15	10	9	9	18







A 0.818

B 70

C 0.856

D 0.7

Using a calculator, work out the value of the correlation coefficient (r) for the following data:

Maths Score	19	16	8	12	20
Science Score	15	10	9	9	18

C **0.856** This is the correct value of r from the calculator

A **0.818** This would be the value of r if the student omitted the final pair of data values

B **70** This is the vale of S_{xy}

D **0.7** This is the value of the constant (a) in the regression equation y = a + bx

For 12 pairs of bivariate data, you are given that:

$$\sum x = 73 \quad \sum y = 68 \quad \sum x^2 = 501 \quad \sum y^2 = 425 \quad \sum xy = 404$$

Which of the following would correctly calculate the value of the correlation coefficient (r)?

A $$\frac{404 - \frac{73 \times 68}{5}}{\sqrt{(501 - \frac{73^2}{5})(425 - \frac{68^2}{5})}}$$

B $$\frac{404 - \frac{73 \times 68}{12}}{\sqrt{(73^2 - \frac{73^2}{12})(68^2 - \frac{68^2}{12})}}$$

C $$\frac{73 \times 68 - \frac{73 \times 68}{12}}{\sqrt{(73^2 - \frac{73^2}{12})(68^2 - \frac{68^2}{12})}}$$

D $$\frac{404 - \frac{73 \times 68}{12}}{\sqrt{(501 - \frac{73^2}{12})(425 - \frac{68^2}{12})}}$$

Question 4 Solution

D

$$\frac{404 - \frac{73 \times 68}{12}}{\sqrt{(501 - \frac{73^2}{12})(425 - \frac{68^2}{12})}}$$

This is the correct use of the formula

A

Thinking n = 5 as there are 5 summary statistics

$$\frac{404 - \frac{73 \times 68}{5}}{\sqrt{(501 - \frac{73^2}{5})(425 - \frac{68^2}{5})}}$$

B

$$\frac{404 - \frac{73 \times 68}{12}}{\sqrt{(73^2 - \frac{73^2}{12})(68^2 - \frac{68^2}{12})}}$$

Squaring $\sum x$ and $\sum y$ to get the values of $\sum x^2$ and $\sum y^2$

C

Same as B, but also making a mistake calculating $\sum x\,y$

$$\frac{73 \times 68 - \frac{73 \times 68}{12}}{\sqrt{(73^2 - \frac{73^2}{12})(68^2 - \frac{68^2}{12})}}$$

The correlation coefficient (r) for 10 pairs of bivariate data (x, y) was calculated to be 0.2.

If the x and y values are all doubled, what is the new value for the correlation coefficient?

A 0.1

B 0.2

C 0.4

D 0.8

The correlation coefficient (r) for 10 pairs of bivariate data (x, y) was calculated to be 0.2.

If the x and y values are all doubled, what is the new value for the correlation coefficient?

C 0.2 Doubling each of the variables has not effect on the strength of the relationship/correlation between them, so the value of r remains unchanged.

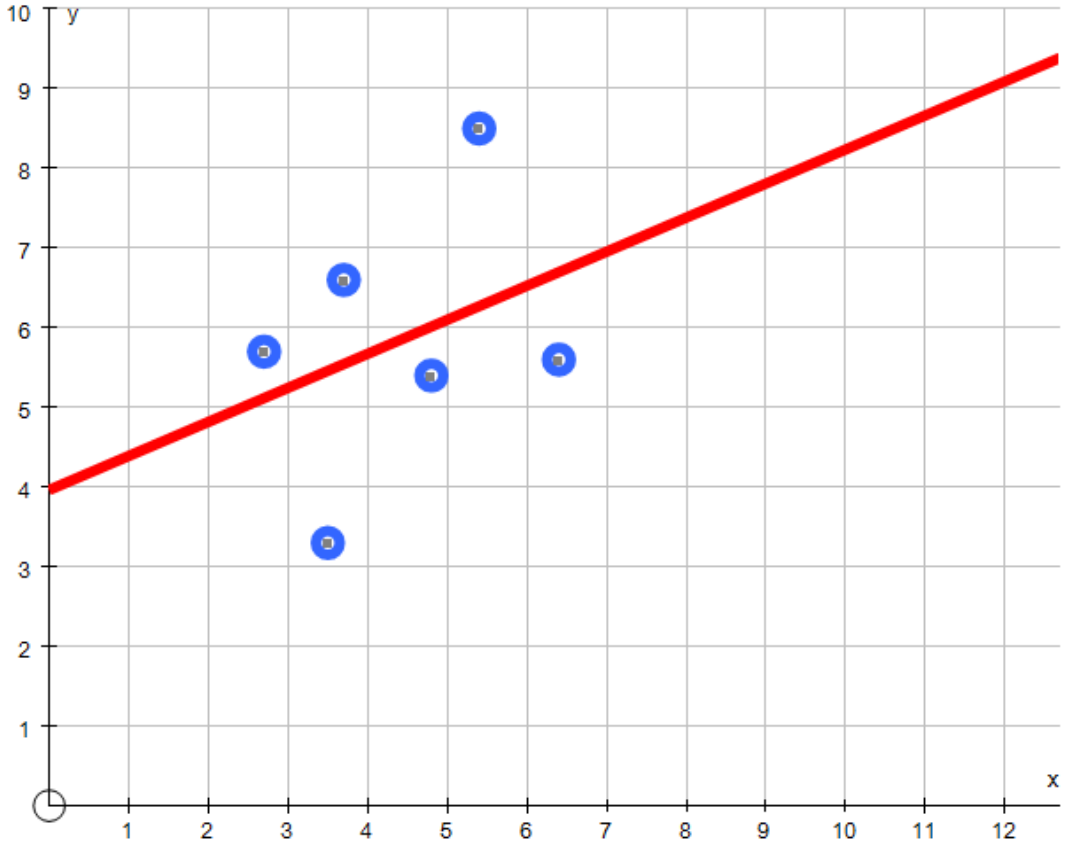
A 0.1 Students may think that as each of the data values are doubled, the strength of correlation halves

C 0.4 Students may think doubling the size of the data values leads to a doubling of the value of r

D 0.8 Finally, as both sets of data are doubled, then students may believe that the size of r increases by a factor of 4

The regression line is in the form $y = a + bx$.

Which of the following is the best estimate for the value of b?



A 4

B 2

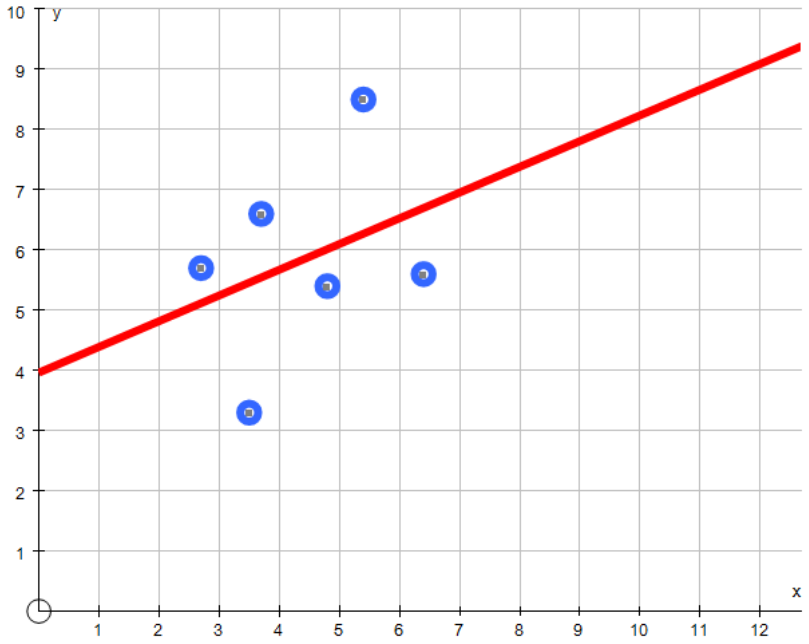
C 0.5

D -2

Question 6 Solution

The regression line is in the form $y = a + bx$.

Which of the following is the best estimate for the size of b?



C 0.5

b is the gradient, which can be seen to be about 0.5

A 4 — Believing b is y-intercept

B 2 — Incorrectly calculating the gradient by doing change in x divided by change in y

D -2 — Getting both the sign and the value of the gradient incorrect

Using a calculator, work out the value of a in the regression line in the form y = a + bx for the following data:

Maths Score (x)	12	19	3	10	4
English Score (y)	8	5	9	12	18

A 15.46

B -0.53

C 9.6

D -0.70

Using a calculator, work out the value of a in the regression line in the form y = a + bx for the following data:

Maths Score (x)	12	19	3	10	4
English Score (y)	8	5	9	12	18

A 15.46 This is the correct value of r from the calculator

B -0.53 This is the value of b

C 9.6 This is the value of $\bar{x}$

D -0.70 This is the value of r

Test 1 (x)	90	24	50	72	12
Test 2 (y)	42	15	23	41	8

Using the data above, the regression line $y = 2.9 + 0.46x$ has been calculated.

Use the regression line to predict a student's Test 2 score given they scored 32 in Test 1

A 42.69

B 63.26

C 15.88

D 17.62

Question 8 Solution

Test 1 (x)	90	24	50	72	12
Test 2 (y)	42	15	23	41	8

Using the data above, the regression line $y = 2.9 + 0.46x$ has been calculated.

Use the regression line to predict a student's Test 2 score given they scored 32 in Test 1

D 17.62

This is the value obtained by correctly substituting x = 32 into the equation.

A 42.69

Using the equation $y = 2.9 \times 0.46x$

B 63.26

This is the value obtained by substituting y = 32 into the equation.

C 15.88

A value such as this might be obtained by students not using the equation, but trying to come up with a sensible guess from looking at the numbers in the table

Test 1 (x)	90	24	50	72	12
Test 2 (y)	42	15	23	41	8

Using the data above, the regression line $y = 2.9 + 0.46x$ has been calculated. Why would it not necessarily be valid to use the regression line to predict a student's Test 2 score who scored 152 on Test 1?

A. Test 1 was only out of 100, so the score is not valid

B. 152 lies outside the range of our recorded data for Test 1, so we do not know if the linear relationship continues

C. The answer is 72.82, which is a decimal, and all the other scores are integers

D. Looking at the marks, it appears that Test 2 was more difficult than Test 1

Question 9 Solution

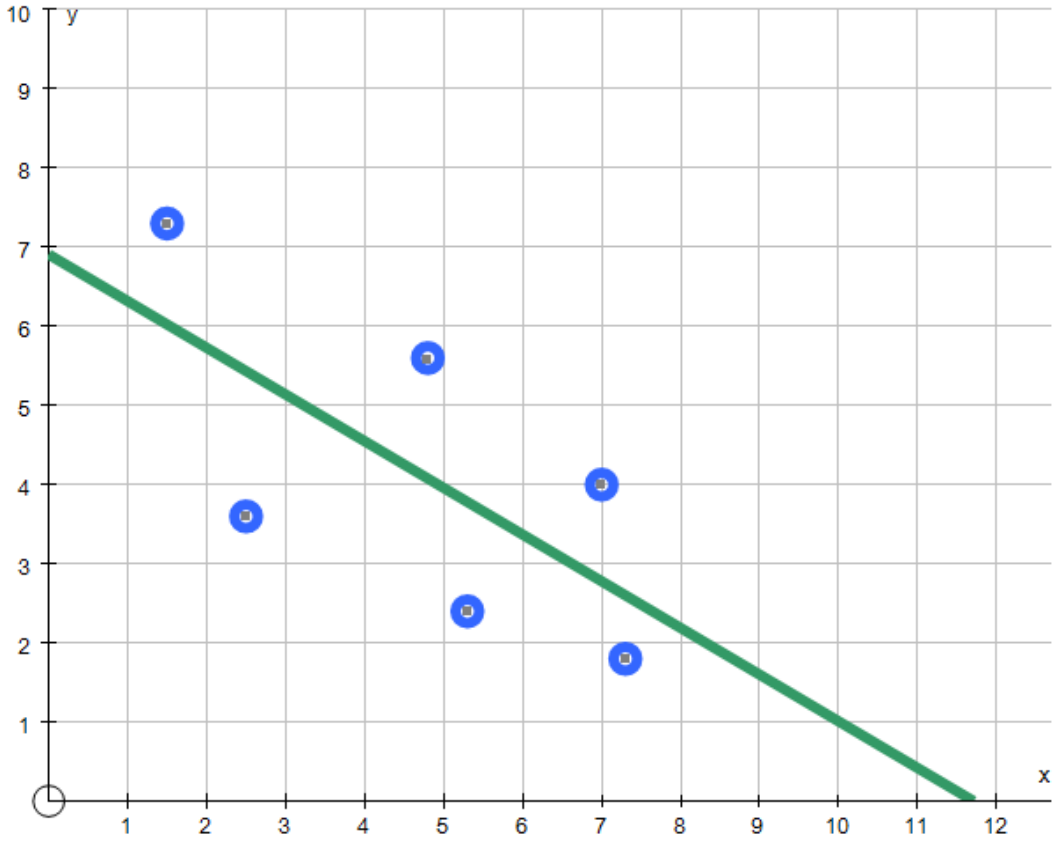
Test 1 (x)	90	24	50	72	12
Test 2 (y)	42	15	23	41	8

Using the data above, the regression line $y = 2.9 + 0.46x$ has been calculated. Why would it not necessarily be valid to use the regression line to predict a student's Test 2 score who scored 152 on Test 1?

B	152 lies outside the range of our recorded data for Test 1, so we no not know if the linear relationship continues	Correct reasoning about the dangers of extrapolation
A	Test 1 was only out of 100, so the score is not valid	There is nothing in the question to suggest this is the case
C	The answer is 72.82, which is a decimal, and all the other scores are integers	This is not relevant as we are making a prediction and can round our answer if needed.
D	Looking at the marks, it appears that Test 2 was more difficult than Test 1	This may be true, but it is not relevant to what we are being asked

The equation of the regression line is $y = 6.9 - 0.6x$.

What is the value of the residual of the data point at (7, 4)?



A 2

B 4.5

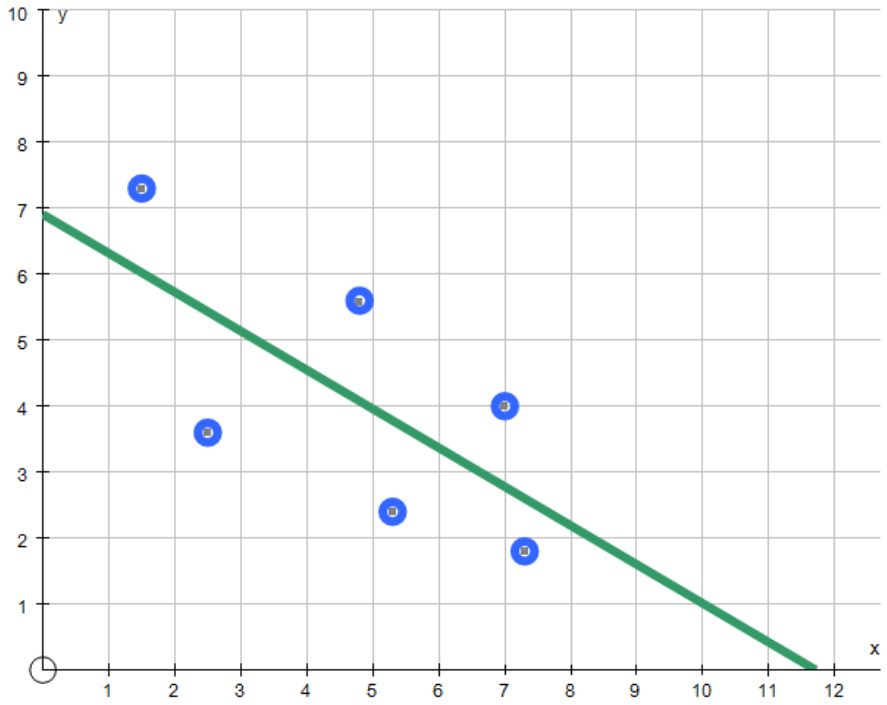
C 1.3

D 2.7

Question 10 Solution

The equation of the regression line is $y = 6.9 - 0.6x$.

What is the value of the residual of the data point at (7, 4)?



C 1.3

Substituting x = 7 into the regression equation to get 2.7, and then doing 4 – 2.7

A 2

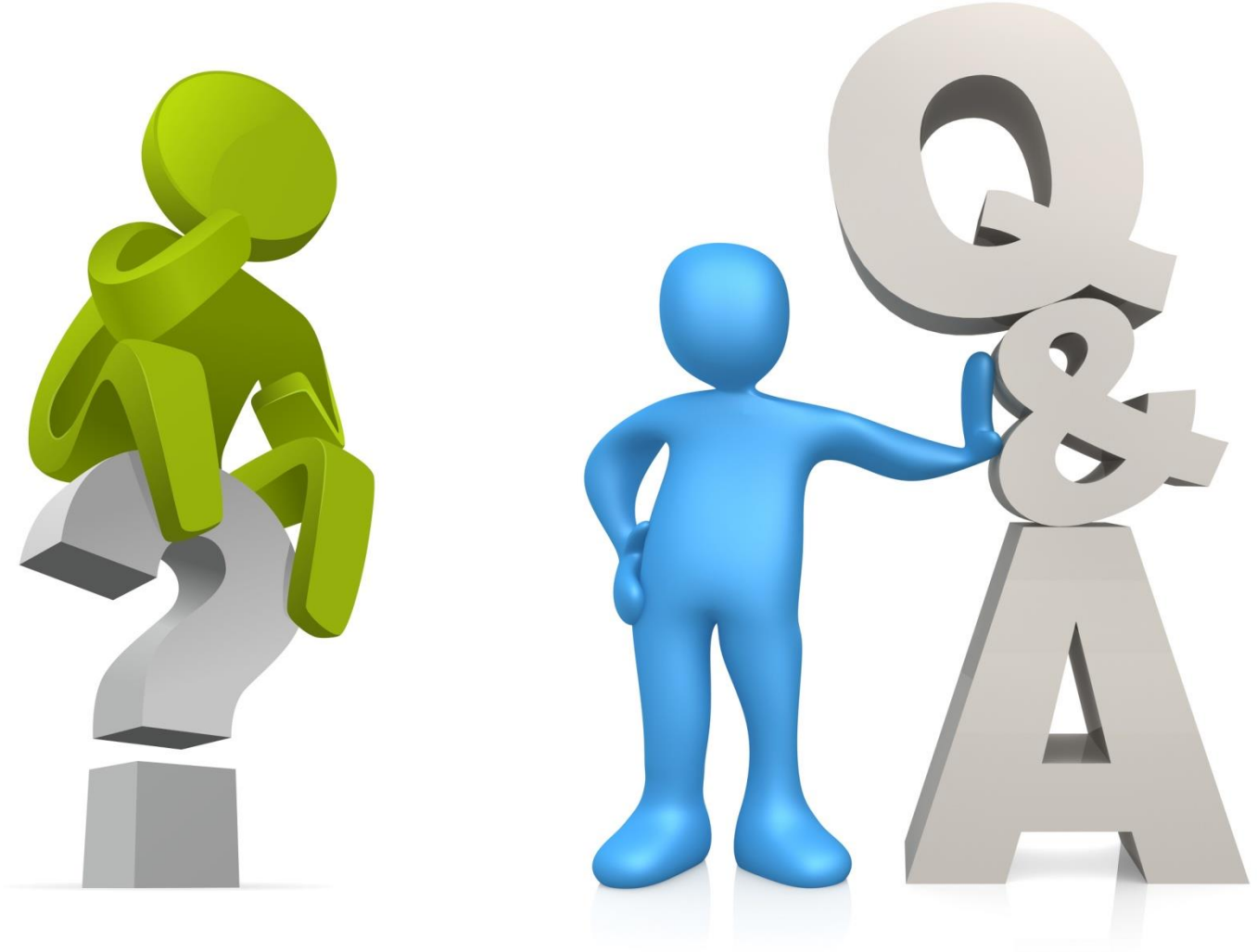
Using the graph to estimate the horizontal residual

B 4.5

Substituting x = 4 into the regression equation

D 2.7

Substituting x = 7 into the regression equation to work out the predicted y value



Thank you
For your attention