



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 11

NOVEMBER 2012

MATHEMATICS P3

MARKS: 100

TIME: 2 hours

This question paper consists of 14 pages, including a formula-sheet and diagram sheets.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of NINE questions. Answer ALL the questions.
2. Show clearly ALL calculations, diagrams, graphs, et cetera which you have used in determining the answers.
3. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
4. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.
5. Number the answers correctly according to the numbering system used in this question paper.
6. Diagrams are NOT necessarily drawn to scale.
7. It is in your own interest to write legibly and to present the work neatly.
8. An information sheet with formulae is attached.
9. Diagram sheets are included to assist in answering QUESTIONS 1.2.1, 7.1, 7.2, 8 and 9. Write your name in the space provided and hand it in with your script.

QUESTION 1

1.1 Complete the following statements:

1.1.1 If A and B are independent events, then $P(A \text{ and } B) = \dots$ (1)

1.1.2 If A and B are mutually exclusive events, then $P(A \text{ or } B) = \dots$ (1)

1.2 Two tests namely a Mathematics test (M) and a Science test (S) are given to a group of 300 learners. It is found that 110 learners failed (f) both tests, 120 learners passed (p) both tests, 30 learners passed the Mathematics test but failed (f) the Science test, and 40 learners passed (p) the Science test but failed (f) the Mathematics test.

1.2.1 Summarise the given information in a two way contingency table below by calculating the values of a, b, c, d, e and f as provided in DIAGRAM SHEET 1. Write the answers on the answer sheet provided on DIAGRAM SHEET 1. (6)

TWO TESTS	Maths (p)	Maths (f)	Total
Science (p)	120	c	e
Science (f)	a	110	f
Total	b	d	300

1.2.2 What is the probability that a learner chosen at random, passed both tests? (1)

1.2.3 What is the probability that a learner chosen at random, passed the Mathematics test, but failed the Science test? (1)

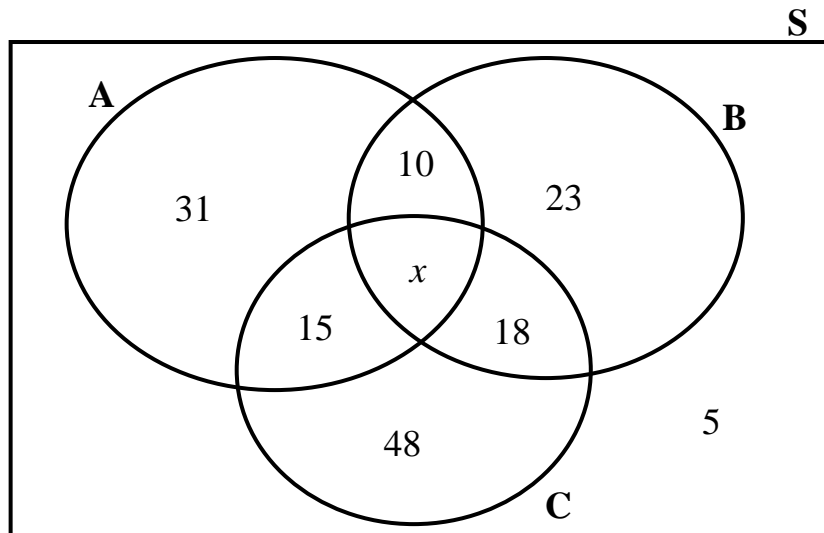
1.2.4 Determine whether passing the Mathematics test (M) and passing the Science test (S) are independent, or dependent events. Support your answer with appropriate calculations. (5)

[15]

QUESTION 2

An independent survey was conducted amongst 160 parents of a particular school to determine their choices for chairman of the School Governing Body (SGB) among three candidates, namely Candidate A, Candidate B and Candidate C.

The Venn-diagram below shows the preferred choices of the parents.



- 2.1 How many parents would like to see that any one of the three candidates become the chairman of the SGB? (2)
- 2.2 What is the probability of a number of parents selected randomly, being undecided in making a decision of who should be the chairman of the SGB? (1)
- 2.3 Calculate the probability that a parent selected at random will be in favour of Candidate B to be the chairman of the SGB. Express your answer as a decimal. (3)
- 2.4 Show that at least 33% of the parents chosen at random would have at least TWO of the candidates selected for chairman of the SGB. (3)

[9]

QUESTION 3

- 3.1 The Human Sciences Research Council (HSRC) conducted a survey amongst 1000 people selected randomly in all the nine provinces about who they will support to become the next president of South Africa with a voter population of about 23 million people.

550 of the participants of the survey said they will vote for candidate X.
Headlines in the newspaper claimed: “55% of all voters support candidate X”.

Discuss the validity of this statement along with any limitations it may have and the misconceptions it could create. (4)

- 3.2 The swimming team of South Africa consists of EIGHT swimmers, namely three men and five women, for the Olympic Games. They have to swim in two qualifying rounds before they can go through to the finals. As part of their rotation policy they must select a captain for each qualifying round.

3.2.1 Draw a tree diagram to determine all the probabilities of men or women being selected as captain – with a column for the first round, then the second round, then the possible outcomes and then probabilities as fractions. Label each branch with its probability. (7)

3.2.2 What is the probability, expressed as a decimal fraction, that both the people chosen will be women? (2)

3.2.3 Express as a percentage, the probability that the two swimmers selected to be captain, will consist of one man and one woman. (3)

[16]

QUESTION 4

The estimated number of HIV-positive infections, as per persons tested by the Department of Health, was released in a news report and is shown in a table below:

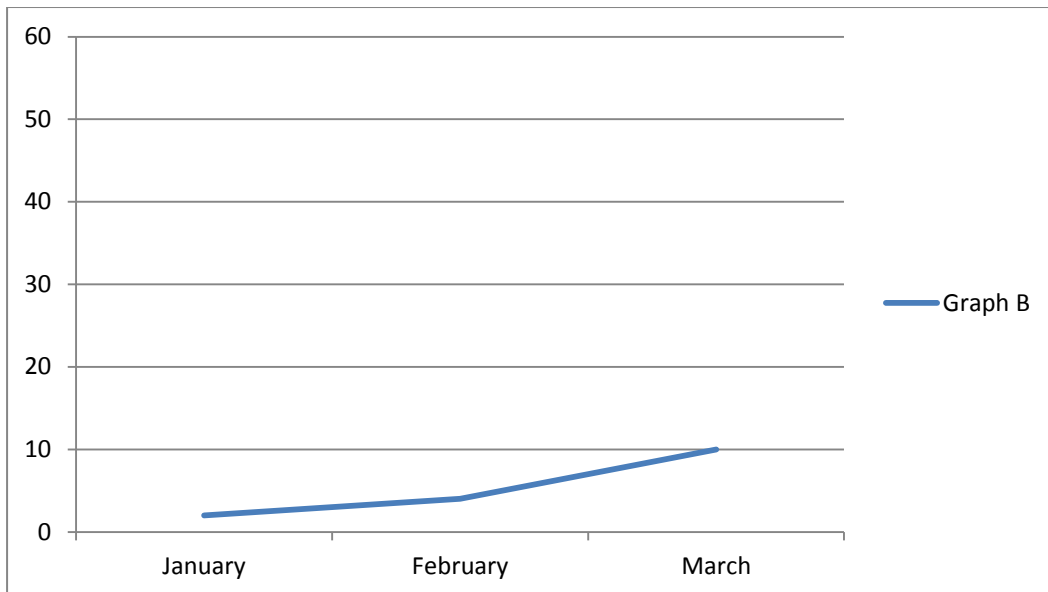
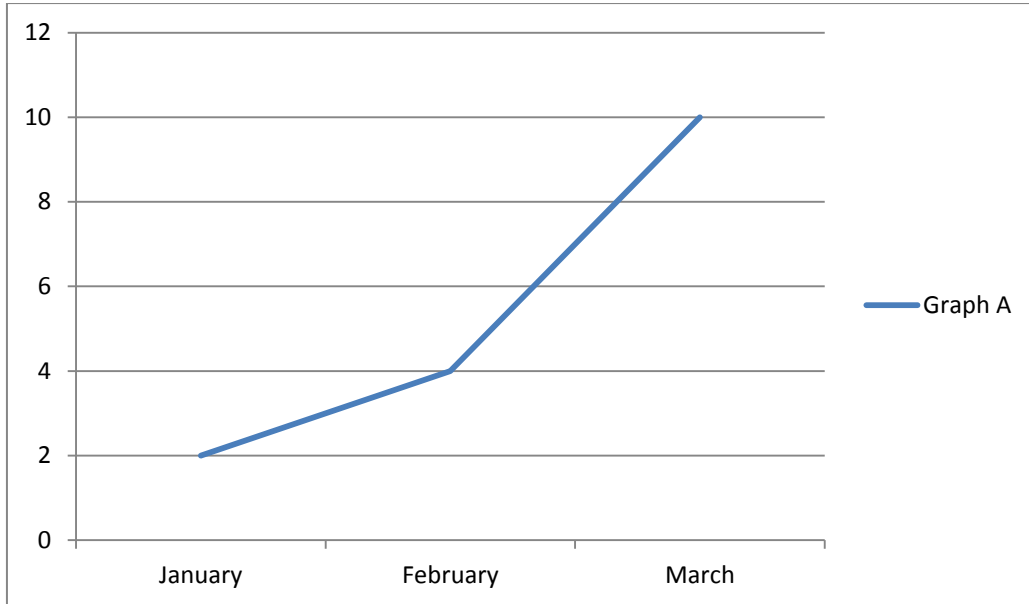
Age group	Estimated infections	Estimated uninfected	Estimated population
15 – 19	398 514	2 130 128	2 528 642
20 – 24	664 716	1 530 514	2 195 230
25 – 29	720 678	1 315 136	2 035 814
30 – 34	540 165	1 206 248	1 746 413
35 – 39	381 155	1 249 108	1 630 263
40+	395 635	2 109 973	2 505 608
TOTAL	3 100 863	9 541 107	12 641 970

- 4.1 If you were to pick a person at random what is the probability that he/she would be HIV-positive? Express your answer as a percentage. (2)
- 4.2 What is the probability that a person would be between 25 – 29 years old and be HIV-positive? Express your answer as a percentage. (2)
- 4.3 What is the probability that a person would be between 15 – 19 years old and not infected? Express your answer as a percentage. (2)
- 4.4 What percentage of the total population that was tested, is HIV-positive? (2)
- 4.5 Which age group has the highest infection rate? Motivate your answer by expressing the highest infection rate as a percentage. (3)
- 4.6 By comparing the different infection rates of the different age groups, give THREE important messages that this news report is trying to convey to the broader public. (3)

[14]

QUESTION 5

The graphs below (Graph A and Graph B) show the number of illegal immigrants (in thousands) from a neighbouring state that has entered the borders of South Africa in a three month period since January 2012 to March 2012. This is according to the Department of Home Affairs.



- 5.1 Which graph (Graph A or Graph B) do you think, displays the information more clearly? What is causing the effect that the one graph is clearer than the other graph? (2)
- 5.2 If you were asked by a television station as the Minister of Home Affairs to discuss the illegal immigrant problem, which graph (Graph A or Graph B) would you use in your discussion? Motivate your answer. (2)
- 5.3 If you were asked by the same television station as a member of the opposition to discuss the illegal immigrant problem, which graph (Graph A or Graph B) would you use in your discussion? Motivate your answer. (2)

[6]

QUESTION 6

The vertices of a certain triangle ΔPQR are $P(4;7)$, $Q(4; \frac{1}{2})$ and $R(1; \frac{9}{2})$.

6.1 If the vertices of ΔPQR is enlarged by a factor of 2, write down the vertices of $\Delta P'Q'R'$ in the following order:

6.1.1 $P'(x;y)$ (1)

6.1.2 $Q'(x;y)$ (1)

6.1.3 $R'(x;y)$ (1)

6.2 If the vertices of ΔPQR is reduced by a factor of 2, write down the vertices of $\Delta P''Q''R''$ in the following order:

6.2.1 $P''(x;y)$ (1)

6.2.2 $Q''(x;y)$ (1)

6.2.3 $R''(x;y)$ (1)

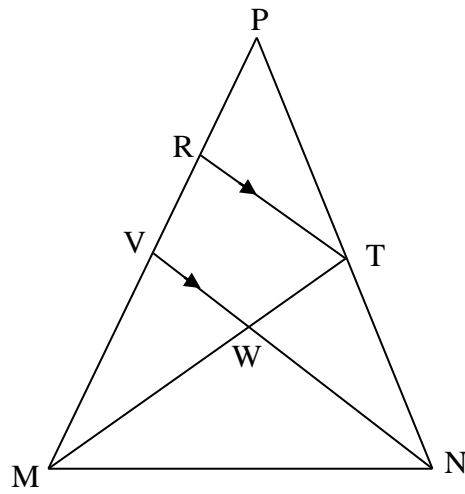
6.3 Is $\Delta PQR \sim \Delta P'Q'R'$? Give a reason for your answer. (2)

6.4 If the area of ΔPQR is $16x \text{ units}^2$, then the area of the enlarged $\Delta P'Q'R'$ with factor 2 would be $\dots x \text{ units}^2$. (2)

[10]

QUESTION 7

7.1 In the figure below, $\triangle PMN$ has V the midpoint of PM. $RT \parallel VN$ and $\frac{TN}{PT} = \frac{4}{7}$.



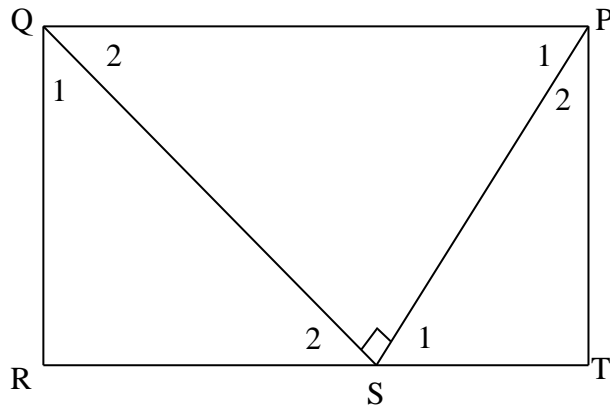
Determine the following:

7.1.1 $\frac{PR}{PV}$ (2)

7.1.2 $\frac{PM}{RV}$ (2)

7.1.3 $\frac{MW}{WT}$ (2)

7.2 In the figure below PQRT is a rectangle with $PS \perp QS$ and $\widehat{PQS} = y$.



Calculate the following angles in terms of y :

7.2.1 \widehat{QSR} (1)

7.2.2 \widehat{PST} (1)

Prove that:

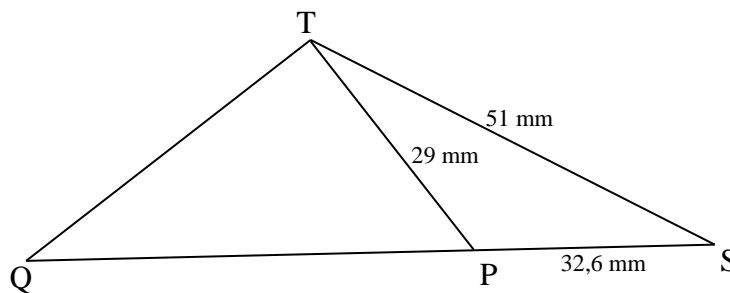
7.2.3 $\triangle PSQ \sim \triangle STP$ (3)

7.2.4 $PS^2 = ST \times (RS + ST)$ (3)

[14]

QUESTION 8

In the figure below, P is a point such that $\widehat{STP} = \widehat{TQS}$, $TS = 51$ mm, $PS = 32,6$ mm and $TP = 29$ mm.



8.1 Prove that $\triangle STP \sim \triangle SQT$. (3)

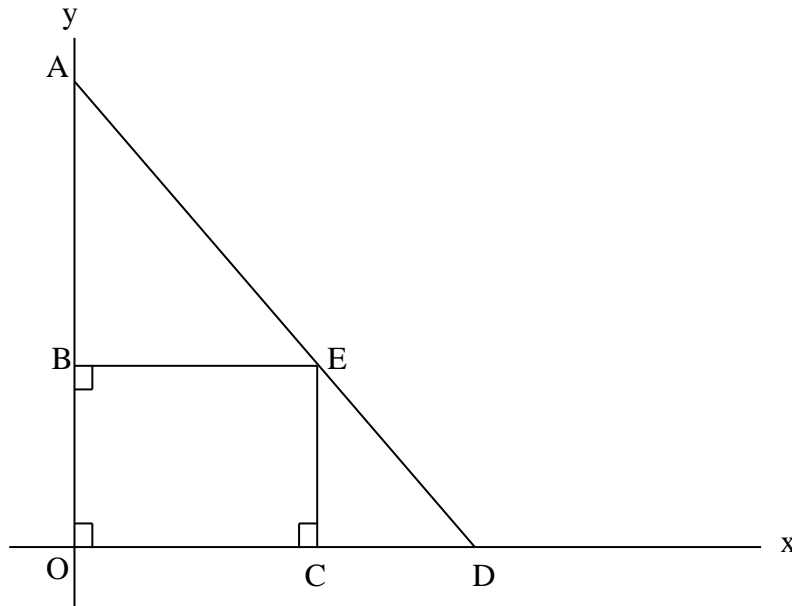
8.2 Show that $SQ = 79,79$ mm. (3)

8.3 Calculate the length of QT correct to TWO decimal places. (3)

[9]

QUESTION 9

In the figure below, OBEC is a rectangle with OA = 20 units, OD = 10 units and CD = p units.



- 9.1 If $\triangle AOD \sim \triangle ECD$, show that $OB = 2p$ units. (3)
 - 9.2 Write down the length of OC in terms of p . (1)
 - 9.3 Hence, show that $\frac{\text{Area of rectangle } OBEC}{\text{Area of } \triangle ECD} = \frac{2(10-p)}{p}$. (3)
- [7]**

TOTAL: 100

INFORMATION SHEET: MATHEMATICS

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

$$A = P(1 - i)^n$$

$$A = P(1 + i)^n$$

$$\sum_{i=1}^n 1 = n$$

$$\sum_{i=1}^n i = \frac{n(n+1)}{2}$$

$$T_n = a + (n - 1)d$$

$$S_n = \frac{n}{2}(2a + (n - 1)d)$$

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1} ; \quad r \neq 1$$

$$S_\infty = \frac{a}{1 - r} ; \quad -1 < r < 1$$

$$F = \frac{x[(1+i)^n - 1]}{i}$$

$$P = \frac{x[1 - (1+i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

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

$$M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1) \quad m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

$$(x - a)^2 + (y - b)^2 = r^2$$

In $\triangle ABC$:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A$$

$$\text{area } \triangle ABC = \frac{1}{2} ab \cdot \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cdot \cos \beta - \sin \alpha \cdot \sin \beta$$

$$\cos(\alpha - \beta) = \cos \alpha \cdot \cos \beta + \sin \alpha \cdot \sin \beta$$

$$\cos 2\alpha = \begin{cases} \cos^2 \alpha - \sin^2 \alpha \\ 1 - 2\sin^2 \alpha \\ 2\cos^2 \alpha - 1 \end{cases}$$

$$\sin 2\alpha = 2\sin \alpha \cdot \cos \alpha$$

$$(x; y) \rightarrow (x \cos \theta + y \sin \theta ; y \cos \theta - x \sin \theta) \quad (x; y) \rightarrow (x \cos \theta - y \sin \theta ; y \cos \theta + x \sin \theta)$$

$$\bar{x} = \frac{\sum fx}{n}$$

$$\sigma^2 = \frac{\sum (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx$$

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$

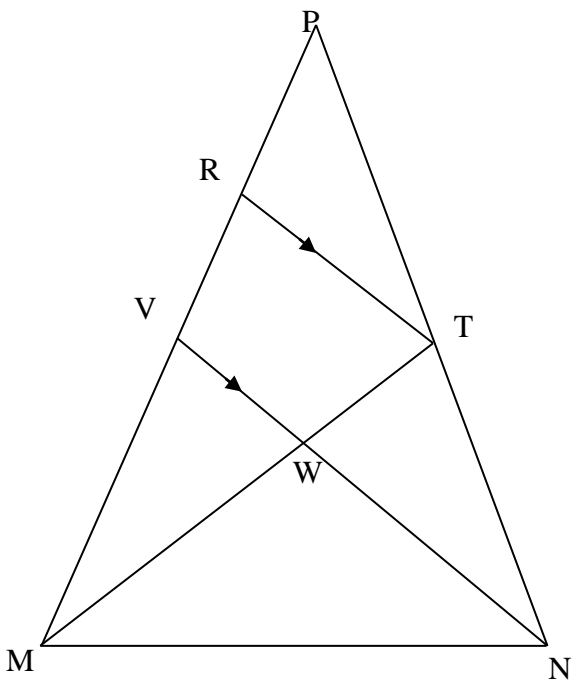
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DIAGRAM SHEET 1

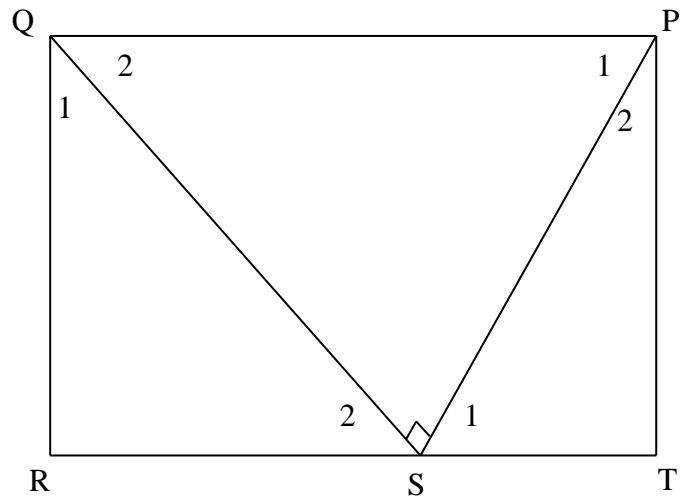
QUESTION 1.2.1

TWO TESTS	Maths (p)	Maths (f)	Total
Science (p)	120	c = _____	e = _____
Science (f)	a = _____	110	f = _____
Total	b = _____	d = _____	300

QUESTION 7.1



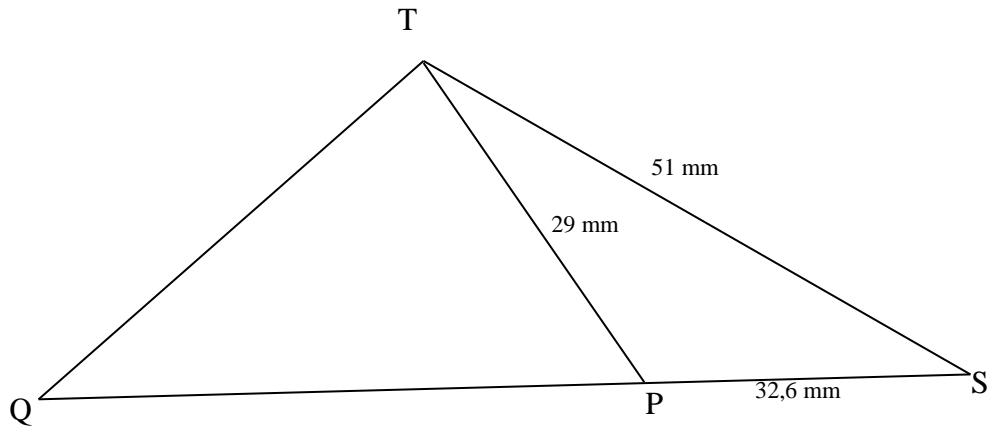
QUESTION 7.2



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DIAGRAM SHEET 2

QUESTION 8



QUESTION 9

