Algebra

Non-negotiable

1. Solve for x: $\sqrt{5-x}-1=x$ (5)

Take it up a notch

2. Given $A=\dfrac{\sqrt{x+4}.(x-3)}{(x-1)^2}$

For what value(s) of x is:

2.1 $A=0$? (2)

2.2 A undefined? (1)

2.3 A non-real? (2)

2.4 $A\leq 0$? (3)

Reach for the stars

3. A closed box has the shape of a rectangular prism with a square base. The sides of the base are x cm long. The height is y cm. The surface area of the box is 288 cm^2. The lengths of the edges are such that $2x+y=21$. Determine the values of x and y. (7)

For further examples, see pages 1 to 4 in the **Grade 12 Maths 2-in-1 Study Guide**, as well as pages 1 and 2 in the Challenging Questions booklet.

More examples can be found in the **Grade 12 Maths Past Papers Toolkit.**

Sequences and Series

Non-negotiable

1. The first three terms of a convergent geometric sequence are $7x+1;\ 2x+2;\ x-1$. Determine the value of x. (7)

Take it up a notch

2. The first four terms of a quadratic pattern are $-124;\ x;\ x^2;\ x^3$. Determine T_n of the sequence. (8)

Reach for the stars

3. Given $\sin x - 2\sin^2 x + 4\sin^3 x - 8\sin^4 x + \ldots$
For what values of x, with $x \in [-180°; 90°]$ will the series converge? (6)

For further examples, see pages 4 to 7 in the **Grade 12 Maths 2-in-1 Study Guide**, as well as pages 2 and 3 in the Challenging Questions booklet.

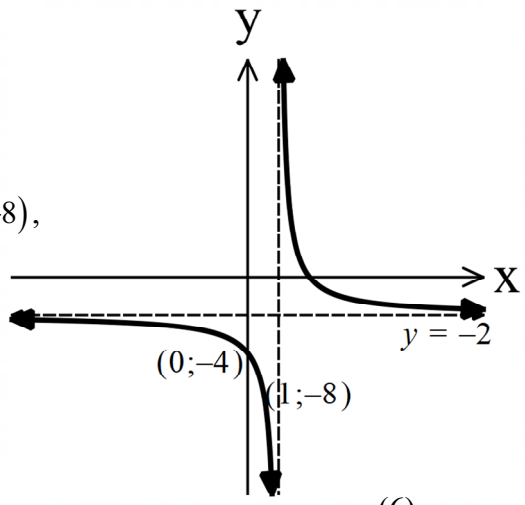
More examples can be found in the **Grade 12 Maths Past Papers Toolkit.**

Functions

Non-negotiable

1. The graph of $f(x)=\frac{k}{x+r}+d$ is sketched alongside.

The graph passes through the points $(0;-4)$ and $(1;-8)$, and has a horizontal asymptote of $y=-2$.



1.1 Determine the values of k, r and d. (6)

1.2 Write down the range of f. (2)

1.3 Write down an equation for the axis of symmetry of f that has a negative gradient. (3)

Take it up a notch

2. Given: $f(x)=\frac{8}{x}+2$. Determine the value of $f(4)+f'(4)+f^{-1}(4)$. (7)

Reach for the stars

3. Given: $f(x)=a^x$ with $0<a<1$, and $h(x)=\frac{k}{x}$ with $k>0$.

Determine the values of x which are common to the domains of $f^{-1}(x)$ and $h(x)$. (4)

For further examples, see pages 8 to 15 in the **Grade 12 Maths 2-in-1 Study Guide**, as well as pages 4 to 9 in the Challenging Questions booklet.

More examples can be found in the **Grade 12 Maths Past Papers Toolkit.**

THE ANSWER SERIES *Your Key to Exam Success*

Finance

Non-negotiable

1. On 30 June 2013 and at the end of each month thereafter, Asif deposited R2 500 into a bank account that pays interest at 6% per annum, compounded monthly. He wants to continue to deposit this amount until 31 May 2018. Calculate how much money Asif will have in this account immediately after depositing R2 500 on 31 May 2018. (5)

Take it up a notch

2. A woman invests R108 706,86 in a bank account and begins withdrawing R6 000 per quarter after three months. How many withdrawals can she make before all the money is withdrawn, if interest is calculated at 15% p.a. compounded quarterly? (5)

Q3 comes from our
Grade 12 Advanced Programme Maths Book 2,
(Finance & Modelling on page Fin.38)

Reach for the stars

3. The Bradford's were granted a bond of R2 million at a rate of 13,5% p.a., compounded monthly, to be amortised in 20 years. Consider the implications of the interest rate changing to 14% p.a., compounded monthly, two years after the bond was granted.

   3.1 If the bond is still to be amortised in 20 years, determine the increased monthly payments. (7)

   3.2 If the monthly payments remain the same, determine how much longer it will take to pay off the bond. (4)

For further examples, see pages 15 to 19 in the **Grade 12 Maths 2-in-1 Study Guide**, as well as pages 20 and 21 in the Challenging Questions booklet.

More examples can be found in the **Grade 12 Maths Past Papers Toolkit.**

Calculus

Non-negotiable

1. Given $f(x) = -3x^2$. Determine $f'(x)$ using first principles. (5)

Take it up a notch

2. The line $g(x) = 5x + 1$ is a tangent to the curve of a function f at the point where $x = 2$. Calculate the value of $f(2) + f'(2)$. (4)

Reach for the stars

3. Given:
   - $f(x) = x^3 + bx^2 + cx + d$
   - $f'(x) > 0$ for $x < -1$ or $x > 2$
   - $f'(x) < 0$ for $-1 < x < 2$

   Determine the values of b and c. (5)

For further examples, see pages 27 to 32 in the **Grade 12 Maths 2-in-1 Study Guide**, as well as pages 9 to 15 in the Challenging Questions booklet.

More examples can be found in the **Grade 12 Maths Past Papers Toolkit.**

Probability

Non-negotiable

1. On a randomly chosen day, the probability that James travels to school by train, by bus or on foot is $\frac{1}{2}$, $\frac{1}{6}$ and $\frac{1}{3}$ respectively. The probability of being late when using these methods of travel is $\frac{1}{5}$, $\frac{2}{5}$ and $\frac{1}{10}$ respectively.

1.1 Draw a tree diagram to represent this information. (3)

1.2 Find the probability that on a randomly chosen day:

1.2.1 James travels by foot and is late. (2)

1.2.2 James is not late. (4)

Take it up a notch

2. Given that $P(A) = 0,35$, $P(B) = 0,45$ and $P(A \text{ and } B) = 0,1$.

2.1 Find $P(A \text{ or } B)$. (2)

2.2 It is further given that $P(C) = 0,2$. The events A and C are mutually exclusive and events B and C are independent.

2.2.1 Determine $P(B \text{ and } C)$. (2)

2.2.2 Draw a Venn diagram showing A, B and C, and all probabilities. (4)

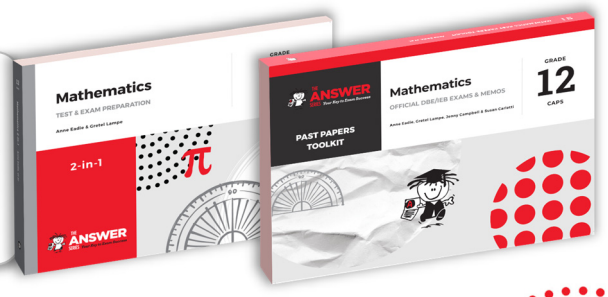
2.2.3 Determine $P[(B \text{ and } C)']$. (2)

Reach for the stars

3. There are 11 players in a cricket team. They are asked to stand in a straight line for a photo. Three of the players, Andrew, Bobby, and Cuan refuse to stand next to each other. The other team members do not mind where they stand. Determine the number of ways in which the 11 players can be positioned for the photo. (5)

For further examples, see pages 50 to 53 in the **Grade 12 Maths 2-in-1 Study Guide**, as well as pages 16 to 19 in the Challenging Questions booklet.

More examples can be found in the **Grade 12 Maths Past Papers Toolkit.**



Data Handling

Non-negotiable

1. Various Grade 3 classes were tested for their reading ability. The following information was gathered.

Class size (x)	Mean reading score (y)
35	70
30	80
35	60
35	72
40	58
33	71
38	68
30	75
29	72
39	62

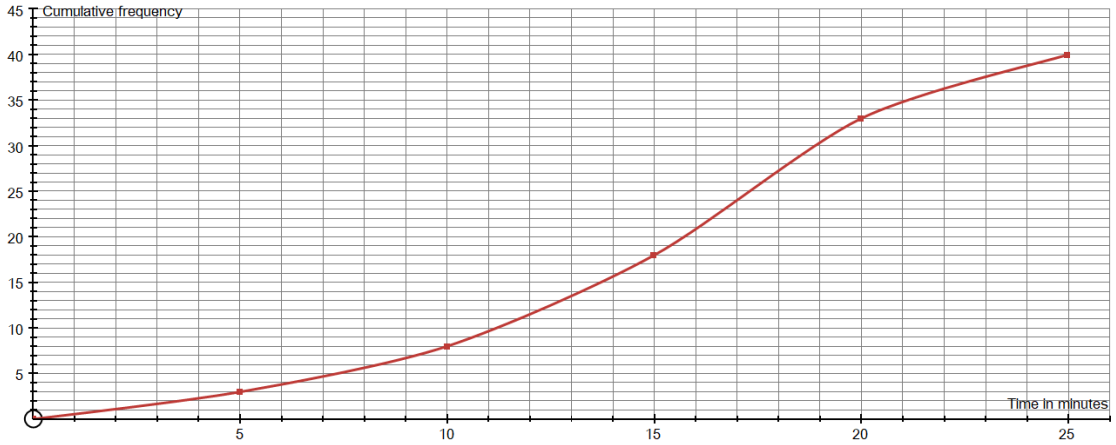
1.1 Determine the equation of the least squares regression line. (3)

1.2 Write down the correlation coefficient. (1)

1.3 Comment on the correlation coefficient, and explain how class size affects the mean reading score. (1)

Take it up a notch

2. The length of time, in minutes, of a certain number of cell phone calls was recorded. No call lasted longer than 25 minutes. A cumulative frequency diagram of this data is shown below.



Draw a box and whisker plot from the cumulative frequency curve. (5)

Reach for the stars

3. Five numbers, a, b, c, d and e, are written in ascending order. Determine the upper quartile if the largest number is 42, the range is 17, the lower quartile is 27, c and d are equal, and the mean of the five numbers is 34. (4)

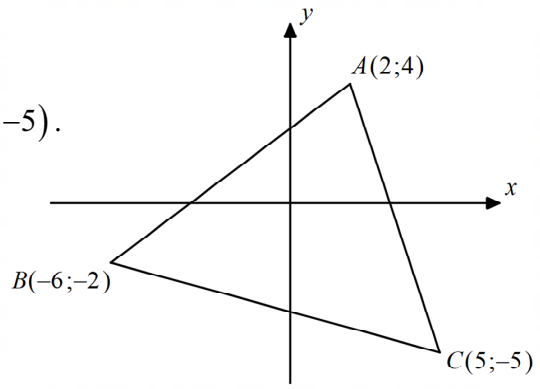
For further examples, see pages 44 to 49 in the **Grade 12 Maths 2-in-1 Study Guide**, as well as page 42 in the Challenging Questions booklet.

More examples can be found in the **Grade 12 Maths Past Papers Toolkit.**

Analytical Geometry

Non-negotiable

1. ΔABC has $A(2;4)$, $B(-6;-2)$ and $C(5;-5)$.



1.1 Determine the co-ordinates of M, the midpoint of AB. (2)

1.2 Determine the gradient of AC. (2)

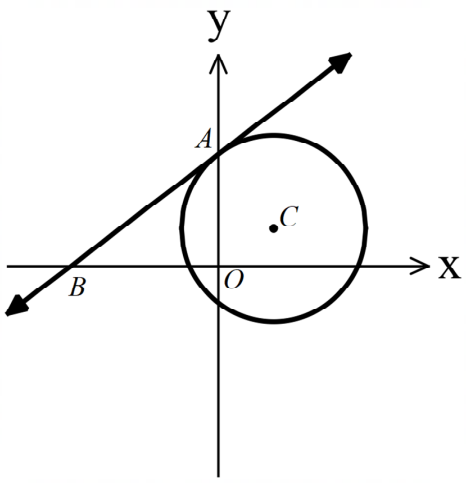
1.3 Determine the equation of the line passing through M parallel to AC. (3)

1.4 Determine the length of AC. (2)

1.5 Write down, with a reason and correct to two decimal places, the length of MN if $MN \parallel AC$ with N on BC. (2)

Take it up a notch

2. In the diagram, the circle with centre C and with equation $x^2 - 6x + y^2 - 4y = 12$ cuts the y-axis at A. BA is a tangent to the circle with B on the x-axis.

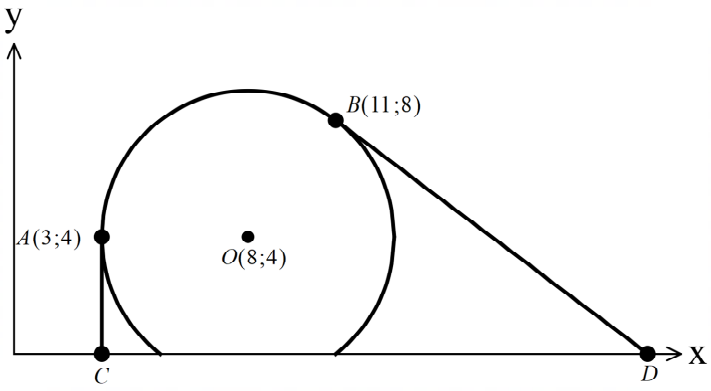


2.1 Determine the co-ordinates of C. (4)

2.2 Determine the equation of BA. (6)

Reach for the stars

3. A circle centred at $O(8;4)$ passes through $A(3;4)$ and $B(11;8)$. AC is a vertical line and BD is a tangent to the circle at B. A piece of wire is stretched from C to A, round the circle to B, then to D on the x axis.



Determine the length of the wire. (10)

For further examples, see pages 33 to 35 in the **Grade 12 Maths 2-in-1 Study Guide**, as well as pages 39 to 41 in the Challenging Questions booklet.

More examples can be found in the **Grade 12 Maths Past Papers Toolkit.**

Trigonometry

Non-negotiable

1. If $\cos\theta = \frac{2}{3}$ and $\theta > 90^\circ$, determine the value of $\cos(\theta + 45^\circ)$ without the use of a calculator. Leave your answer in surd form. (4)

Take it up a notch

2. Prove the identity:

$$2\cos\theta.\cos 2\theta + \frac{\sin^2 2\theta}{\cos\theta} = 2\cos\theta$$ (4)

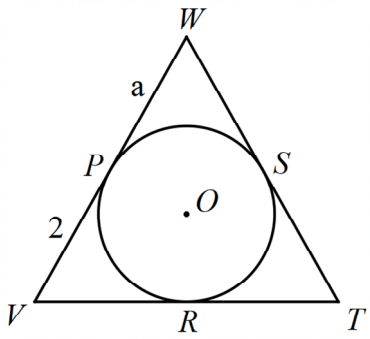
Reach for the stars

3. In the diagram, circle PSR with centre O is drawn inside ΔWVT, as shown.

WV = WT

WP = a units

PV = 2 units



Determine $\cos V$ in terms of a. (7)

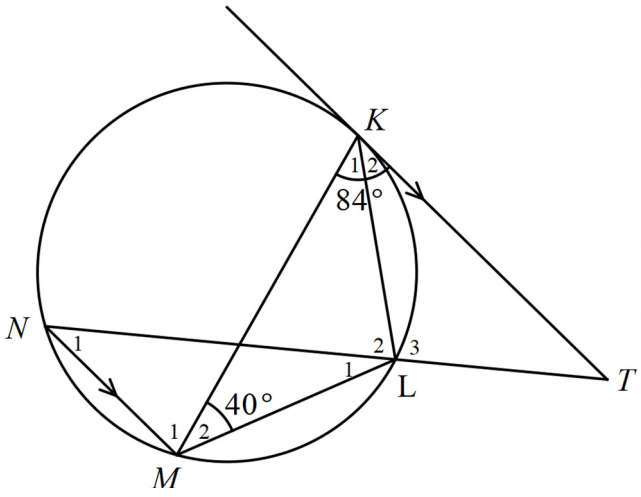
For further examples, see pages 19 to 27 in the **Grade 12 Maths 2-in-1 Study Guide**, as well as pages 23 to 28 in the Challenging Questions booklet.

More examples can be found in the **Grade 12 Maths Past Papers Toolkit.**

Euclidean Geometry

Non-negotiable

1. In the diagram, tangent KT to the circle at K is parallel to the chord NM. NT cuts the circle at L. ΔKML is drawn. $\widehat{M}_2 = 40°$ and $M\widehat{K}T = 84°$.



Determine, giving reasons, the size of:

1.1 $\widehat{K}_2$ (2)

1.2 $\widehat{N}_1$ (3)

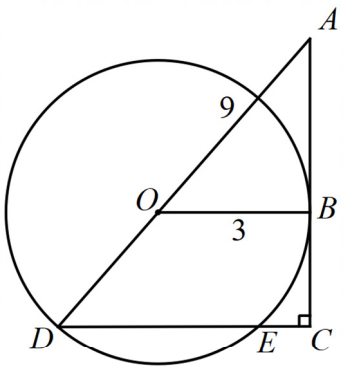
1.3 $\hat{T}$ (2)

1.4 $\hat{L}_2$ (2)

1.5 $\hat{L}_1$ (1)

Take it up a notch

2. O is the centre of the circle. Tangent ABC meets chord DE produced to C such that $\widehat{C} = 90°$. DO produced meets the tangent at A. $AO = 9$ units and $OB = 3$ units.



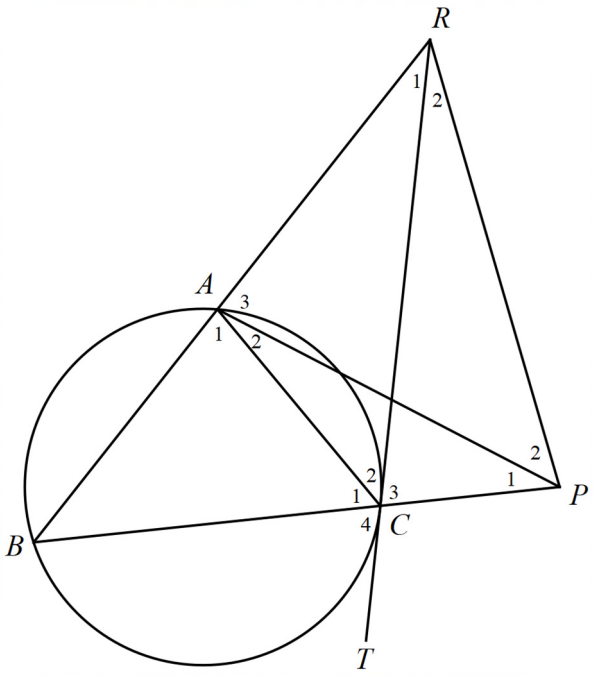
Calculate, giving reasons:

2.1 AB (4)

2.2 BC (5)

Reach for the stars

3. In the diagram, chord BA and tangent TC of circle ABC are produced to meet at R. BC is produced to P with RC = RP. AP is not a tangent.



3.1 Prove that:

3.1.1 ACPR is a cyclic quadrilateral. (5)

3.1.2 $\Delta CBA \,|||\, \Delta RPA$ (4)

3.1.3 $RC = \dfrac{CB.RA}{AC}$ (2)

3.1.4 $RB.AC = RC.CB$ (4)

3.2 Hence, prove that $RC^2 = RA.RB$ (3)

For further examples, see pages 36 to 43 in the **Grade 12 Maths 2-in-1 Study Guide**, as well as pages 29 to 38 in the Challenging Questions booklet.

More examples can be found in the **Grade 12 Maths Past Papers Toolkit.**