Algebra

Non-negotiable

1.1 Solve for x: $\frac{2x+1}{5} - x \leq \frac{1}{2}(3x-4)+3$ (5)

$\therefore 2(2x+1) - 10x \leq 5(3x-4)+30$ ✓ … multiply every term by 10

$\therefore 4x + 2 - 10x \leq 15x - 20 + 30$ ✓

$\therefore -21x \leq 8$ ✓

$\therefore x \geq -\frac{8}{21}$ ✓✓ … note the inequality sign changes

1.2 Solve for x and y: $x - 4y = 12$ and $3x + 2y = 8$ (4)

$x - 4y = 12$ ①

$3x + 2y = 8$ ②

$3 \times$ ① $3x - 12y = 36$ ③ ✓

② – ③ $\therefore 14y = -28$ ✓

$\therefore y = -2$ ✓

$x - 4(-2) = 12$

$\therefore x = 4$ ✓

$\therefore x = 4$ and $y = -2$

Take it up a notch

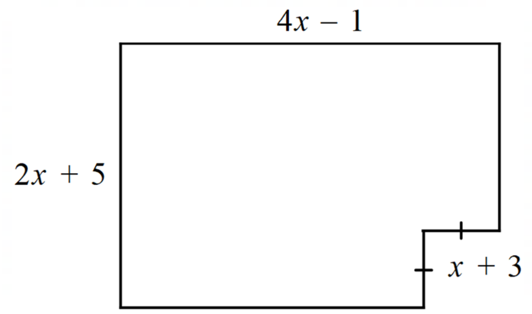
2.1 Simplify $\frac{8x^3 - 1}{2x^2 + 5x - 3} \div \frac{8x^3 + 4x^2 + 2x}{8x^3 + 24x^2}$ (6)

$$\frac{(2x-1)(4x^2+2x+1)✓}{(2x-1)(x+3)✓} \times ✓ \frac{8x^2(x+3)✓}{2x(4x^2+2x+1)✓}$$

$$= \frac{8x^2}{2x}$$

$= 4x$ ✓

2.2 Determine the value of x if the area of the shape below is 146 units^2.



(6)

$$(4x-1)(2x+5)-(x+3)^2=146 \checkmark$$

$$\therefore 8x^2+18x-5-(x^2+6x+9)=146$$

$$\therefore 8x^2+18x-5-x^2-6x-9=146 \checkmark$$

$$\therefore 7x^2+12x-160=0 \checkmark$$

$$\therefore (x-4)(7x+40)=0 \checkmark$$

$$\therefore x=4 \text{ or } x=-\frac{40}{7} \checkmark$$

$\therefore x=4$ ✓ … the sides cannot have negative lengths

Reach for the stars

https://www.theanswer.co.za/maths-grade-10-revision-algebra-2022/

3. Given $9^w=11;\ 11^x=15;\ 15^y=22;\ 22^z=27$. Determine the value of $wxyz$ without the use of a calculator. (5)

$$9^w=11$$

$$\therefore (9^w)^x=11^x=15 \checkmark$$

$$\therefore \left((9^w)^x\right)^y=15^y=22 \checkmark$$

$$\therefore \left(\left((9^w)^x\right)^y\right)^z=22^z=27 \checkmark$$

$$\therefore 9^{wxyz}=27$$

$$\therefore 3^{2wxyz}=3^3 \checkmark$$

$$\therefore 2wxyz=3$$

$$\therefore wxyz=\frac{3}{2} \checkmark$$

Patterns

Non-negotiable

1. Given: 2; 8; 14; 20; 26; …

1.1 Write down the next term of the pattern. (1)

32 ✓

1.2 Determine the n th term of the pattern. (2)

$T_n = 6n$✓-4✓

1.3 Write down the 100th term. (2)

$T_{100} = 6(100) - 4$✓$= 596$✓

1.4 Which term is equal to 278? (2)

$6n - 4 = 278$ ✓
$\therefore 6n = 282$
$\therefore n = 47$ ✓

Take it up a notch

2. The pattern below consists of grey and white squares. Only consider unit squares in this example.

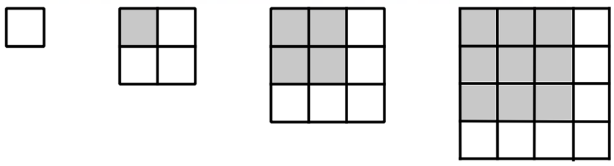


Fig. 1 Fig. 2 Fig. 3 Fig. 4

2.1 Write down the number of grey squares in the 15th figure. (1)

Figure	1	2	3	4	15
Number of grey squares	0	1	4	9	196 ✓

2.2 Determine the number of white squares in the 15th figure. (2)

Figure	1	2	3	4	15
Number of white squares	1	3	5	7	29 ✓

2.3 Determine the number of grey squares that are in the figure that has 379 white squares. (4)

White squares: $T_n = 2n - 1$

$\therefore 2n - 1 = 379$ ✓

$\therefore n = 190$ ✓

Grey squares: $T_n = (n-1)^2$

$\therefore T_{190} = (190-1)^2$ ✓ $= 35\ 721$ ✓

2.4 Two consecutive figures have a TOTAL number of 10 805 squares. Determine which two figures these are. (5)

Total squares: $T_n = n^2$

$\therefore n^2 + (n+1)^2 = 10\ 805$ ✓

$\therefore n^2 + n^2 + 2n + 1 = 10\ 805$ ✓

$\therefore 2n^2 + 2n - 10\ 804 = 0$

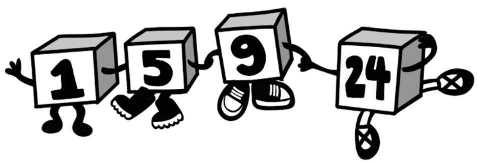
$\therefore n^2 + n - 5\ 402 = 0$ ✓

$\therefore (n-73)(n+74) = 0$ ✓

$\therefore n = 73$ *or* $n = -74$

$\therefore n = 73$

$\therefore$ the 73rd and 74th figures. ✓



Reach for the stars

https://www.theanswer.co.za/maths-grade-10-revision-patterns-2022/

3. Given:
$1^2+2^2=3^2-2^2$ Row 1
$2^2+3^2=7^2-6^2$ Row 2
$3^2+4^2=13^2-12^2$ Row 3

3.1 Write down row 4. (1)

$4^2+5^2=21^2-20^2$ ✓

3.2 Write down row n. (2)

If you are not sure how to get these answers, watch the video!

$n^2+(n+1)^2=[n(n+1)+1]^2-[n(n+1)]^2$ ✓✓

$\therefore n^2+(n+1)^2=(n^2+n+1)^2-(n^2+n)^2$

Or

$n^2+(n+1)^2=[(n+1)+n^2]^2-[(n+1)+n^2-1]^2$ ✓✓

$\therefore n^2+(n+1)^2=(n^2+n+1)^2-(n^2+n)^2$

3.3 Prove algebraically that row n is true. (4)

$LHS=n^2+(n+1)^2$

$\therefore LHS=n^2+n^2+2n+1$

$\therefore LHS=2n^2+2n+1$ ✓

$RHS=(n^2+n+1)^2-(n^2+n)^2$

$\therefore RHS=[(n^2+n+1)-(n^2+n)][(n^2+n+1)+(n^2+n)]$ ✓✓

$\therefore RHS=[1][2n^2+2n+1]$ ✓

$\therefore RHS=2n^2+2n+1$

$\therefore LHS=RHS$

Or

$LHS=n^2+(n+1)^2$

$\therefore LHS=n^2+n^2+2n+1$

$\therefore LHS=2n^2+2n+1$ ✓

$RHS=(n^2+n+1)^2-(n^2+n)^2$

$\therefore RHS=n^4+n^2+1+2n^3+2n^2+2n-(n^4+2n^3+n^2)$ ✓✓

$\therefore RHS=n^4+n^2+1+2n^3+2n^2+2n-n^4-2n^3-n^2$ ✓

$\therefore RHS=2n^2+2n+1$

$\therefore LHS=RHS$

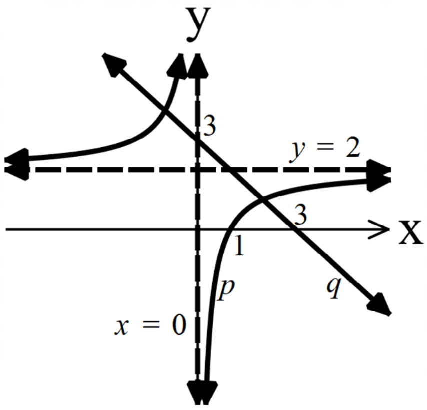
Functions

Non-negotiable

1. Given $p(x) = -\frac{2}{x} + 2$ and $q(x) = -x + 3$.

1.1 Draw the graphs of p and q on the same set of axes. Show all important information. (5)

✓ asymptotes of p
✓ $(1;0)$
✓ shape of p
✓ $(0;3)$
✓ $(3;0)$



1.2 Write down the range of p. (2)

$y \in \mathbb{R};\ y \neq 2$ ✓✓

1.3 Write down the equation of the axis of symmetry of p that has a positive gradient. (2)

$y = x$✓$+2$✓

1.4 For what value(s) of x is:

1.4.1 $p(x) = q(x)$? (5)

$-\frac{2}{x} + 2 = -x + 3$ ✓

$\therefore -2 + 2x = -x^2 + 3x$ ✓

$\therefore x^2 - x - 2 = 0$ ✓

$\therefore (x-2)(x+1) = 0$ ✓

$\therefore x = 2$ or $x = -1$ ✓

1.4.2 $p(x) > 0$? (2)

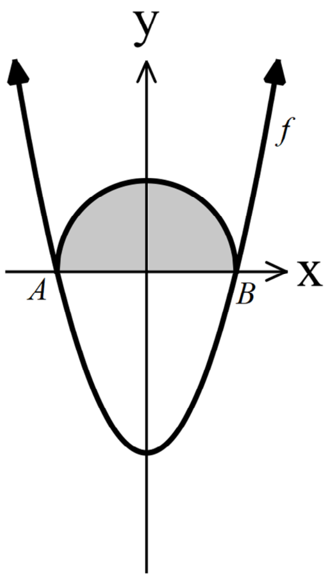
$x < 0$✓ or $x > 1$✓

1.4.3 $p(x) \geq q(x)$? (3)

$-1 \leq x < 0$✓✓ or $x \geq 2$✓

Take it up a notch

2. $f(x) = ax^2 + c$ is drawn passing through $(2;-6)$ and $(-8;24)$. A semi-circle is drawn with AB as the diameter.



2.1 Determine the equation of $f(x)$. (4)

$y = ax^2 + c$

Subs $(2;-6)$ $\quad -6 = 4a + c$ ① ✓

Subs $(-8;24)$ $\quad 24 = 64a + c$ ② ✓

② – ① $\quad 30 = 60a$

$\therefore a = \frac{1}{2}$ ✓

$-6 = 4\left(\frac{1}{2}\right) + c$

$\therefore c = -8$ ✓

$\therefore f(x) = \frac{1}{2}x^2 - 8$

2.2 Hence determine the area of the semi-circle, correct to two decimal places. (4)

$\frac{1}{2}x^2 - 8 = 0$ ✓

$\therefore x^2 - 16 = 0$

$\therefore (x-4)(x+4) = 0$ ✓

$\therefore A(-4;0)$ and $B(4;0)$

$Area = \frac{1}{2} \times \pi \times 4^2$ ✓

$\therefore Area = 25{,}13$ units^2 ✓

Reach for the stars

https://www.theanswer.co.za/maths-grade-10-revision-functions-2022/

3. The function $y = f(x)$ is a straight line. $f(0) = 5$ and $f(f(0)) = -5$.

Determine $f\left(f\left(f(0)\right)\right)$. (5)

$f(f(0)) = -5$

$\therefore f(5) = -5$ ✓ … since $f(0) = 5$

$f(x)$ is a straight line with $(0;5)$ and $(5;-5)$ on it.

$5 = m(0) + c$

$\therefore c = 5$ ✓

$-5 = m(5) + 5$

$\therefore m = -2$ ✓

$\therefore f(x) = -2x + 5$

$f\left(f\left(f(0)\right)\right)$

$= f(f(5))$

$= f(-5)$ ✓

$= -2(-5) + 5$

$= 15$ ✓

Finance

Non-negotiable

1. An amount of R5 000 is invested in an account at 5,6% p.a. compounded quarterly. Determine the total amount in the account after six years. (3)

$$A = 5\ 000\left(1+\frac{0,056}{4}\right)^{6\times 4} \checkmark\checkmark$$

$$\therefore A = R6\ 980,41 \checkmark$$

Take it up a notch

2. R7 000 is invested at 8% p.a. compounded quarterly for two years. The interest rate then changes to $x\%$ p.a. compounded monthly for four years. You are hoping to have at least R12 000 in the account after the six years. Determine, correct to two decimal places, the smallest value of x that will result in this. (5)

$$7\ 000\left(1+\frac{0,08}{4}\right)^{2\times 4}\checkmark\left(1+\frac{x\%}{12}\right)^{4\times 12}\checkmark = 12\ 000\checkmark$$

$$\therefore \left(1+\frac{x\%}{12}\right)^{48} = 1,46312...$$

$$\therefore 1+\frac{x\%}{12} = 1,00796...\checkmark$$

$$\therefore x = 9,55220...$$

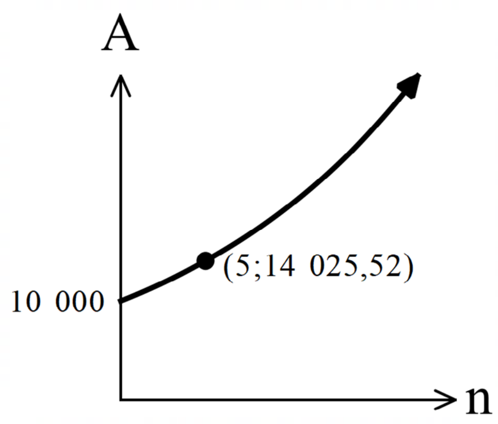
$\therefore$ to get at least R12 000, the lowest rate correct to two decimal places is $9,56\%$. ✓

Reach for the stars

https://www.theanswer.co.za/maths-grade-10-revision-finance-2022/

3. A certain amount of money is invested in an account offering compound interest.

The graph below represents the formula $A = P(1+i)^n$. The points $(0; R10\ 000)$ and $(5; R14\ 025,52)$ lie on the graph.



Determine the value of i correct to the nearest integer. (5)

$10\ 000 = P(1+i)^0$ ✓ … subs $(0; R10\ 000)$

$\therefore P = 10\ 000$ ✓

$14\ 025,52 = 10\ 000(1+i)^5$ ✓ …subs $(5; R14\ 025,52)$

$\therefore (1+i)^5 = 1,402552$ ✓

$\therefore 1+i = 1,07000...$

$\therefore i = 0,07000...$

$\therefore i = 7\%$ ✓

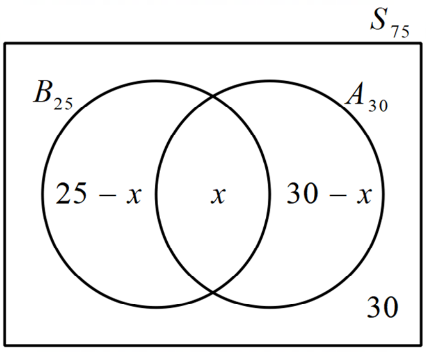
Probability

Non-negotiable

1. There are 75 learners in Grade 10 at a particular school. 25 of them like working in the library before school, 30 of them like working in the library after school, and 30 never go into the library.

   1.1 Use a Venn diagram to determine the number of learners who work in the library both before and after school. (4)

✓✓



$25 - x + x + 30 - x + 30 = 75$ ✓

$\therefore 85 - x = 75$

$\therefore x = 10$ ✓

$\therefore$ 10 learners work in the library both before and after school

   1.2 Determine the probability that a learner only works in the library after school. (2)

$P = \dfrac{30-10}{75}$ ✓

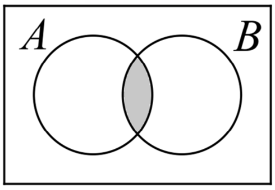
$\therefore P = \dfrac{4}{15}$ ✓

Take it up a notch

2. Use a new Venn diagram for each question and shade the required area.

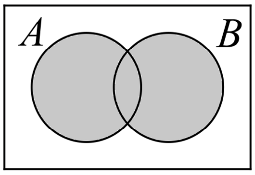
2.1 $P(A \text{ and } B)$ (2)

✓✓



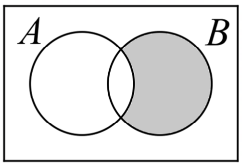
2.2 $P(A \text{ or } B)$ (2)

✓✓



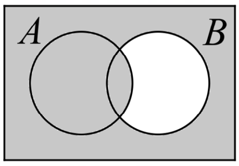
2.3 $P(A' \text{ and } B)$ (2)

✓✓



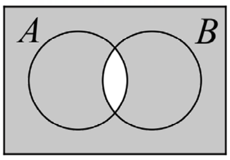
2.4 $P(A \text{ or } B')$ (2)

✓✓



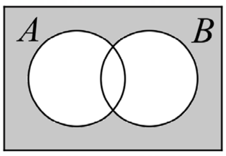
2.5 $P(A \text{ and } B)'$ (2)

✓✓



2.6 $P(A' \text{ and } B')$ (2)

✓✓



Reach for the stars

https://www.theanswer.co.za/maths-grade-10-revision-probability-2022/

3. Given:

- $P(A \text{ and } B) = 0,2$
- $P(A \text{ or } B)' = 0,28$
- $P(B) = 3P(A)$

Determine $P(B \text{ and } A')$. (5)

$P(A \text{ or } B)' = 0,28$

$\therefore P(A \text{ or } B) = 1 - 0,28 = 0,72$ ✓

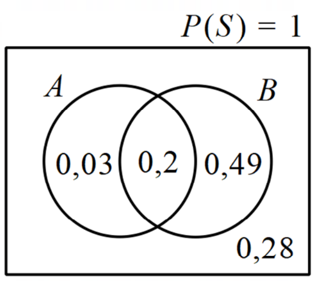
$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$\therefore 0,72 = P(A) + 3P(A) - 0,2$ ✓

$\therefore 4P(A) = 0,92$

$\therefore P(A) = 0,23$ ✓

$\therefore P(B) = 3 \times 0,23 = 0,69$

✓ 

$\therefore P(B \text{ and } A') = 0,49$ ✓

Data Handling

Non-negotiable

1. The following marks were obtained by a class of Grade 10 learners on a test out of 50 marks.

Marks	**Frequency**
$0 < x \leq 10$	2
$10 < x \leq 20$	7
$20 < x \leq 30$	13
$30 < x \leq 40$	8
$40 < x \leq 50$	5

1.1 Determine the approximate mean of the data. (4)

Marks	**Frequency** (f)	**Midpoint** (x)	$f \times x$
$0 < x \leq 10$	2	5	10
$10 < x \leq 20$	7	15	105
$20 < x \leq 30$	13	25	325
$30 < x \leq 40$	8	35	280
$40 < x \leq 50$	5	45	225
Sum	35 ✓		945 ✓✓

Approximate mean $= \dfrac{945}{35} = 27$ ✓

1.2 Write down the modal class. (1)

$20 < x \leq 30$ ✓

1.3 What percentage of the class achieved more than 80%? Give your answer to the nearest percentage. (2)

$\dfrac{5✓}{35} = 14\%$✓

Take it up a notch

2. Eight numbers are written in ascending order.

   17; 20; 21; 27; x; 32; 36; 39

   Determine the value of x, if the mean and the median of all eight numbers is the same. (5)

$$\text{Median } = \frac{27+x}{2} \ \checkmark$$

$$\text{Mean } = \frac{192+x}{8} \ \checkmark$$

$$\therefore \frac{27+x}{2} = \frac{192+x}{8} \ \checkmark$$

$$\therefore 8(27+x) = 2(192+x)$$

$$\therefore 216+8x = 384+2x \ \checkmark$$

$$\therefore 6x = 168$$

$$\therefore x = 28 \ \checkmark$$

Reach for the stars

https://www.theanswer.co.za/maths-grade-10-revision-data-2022/

3. The following stem and leaf diagram is given.

This is a very unusual way of asking this – look at the key carefully!

6	0 2 2
10	1 3 3 3
14	0 2 2 3 3
18	0 2 3 3 3 3
22	3 3 3 3
26	0 0 2
30	1 2

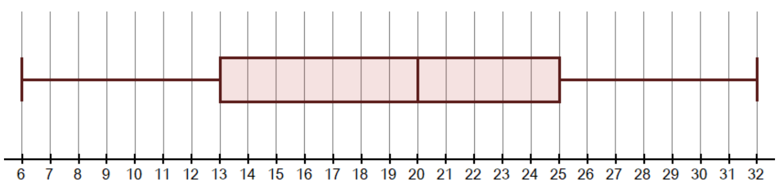
Key 6 | 2 means 6 + 2 = 8

3.1 Determine the five number summary for the data. (4)

Median $= 18+2 = 20$ ✓
Lower quartile $= 10+3 = 13$ ✓
Upper quartile $= 22+3 = 25$ ✓
Five number summary: 6; 13; 20; 25; 32 ✓

3.2 Draw a box and whisker diagram for the data. (3)

✓✓✓



Analytical Geometry

Non-negotiable

1. Given: $A(-3;4)$ and $B(1;-6)$

1.1 Determine the length of AB in surd form. (2)

$$AB=\sqrt{(-3-1)^2+(4-(-6))^2}\ \checkmark$$

$$\therefore AB=\sqrt{116}=2\sqrt{29}\ \checkmark$$

1.2 Determine the midpoint of AB. (2)

$$\text{Midpoint }=\left(\frac{-3+1}{2};\frac{4+(-6)}{2}\right)=(-1;-1)\ \checkmark\checkmark$$

1.3 Determine the gradient of AB. (2)

$$m_{AB}=\frac{4-(-6)}{-3-1}\checkmark=-\frac{5}{2}\checkmark$$

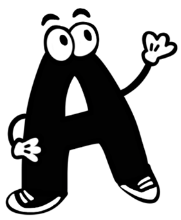
1.4 Determine the equation of AB. (2)

$$y=-\frac{5}{2}x+c$$

$$\therefore 4=-\frac{5}{2}(-3)+c\ \checkmark \qquad \ldots\text{ subs } A(-3;4)$$

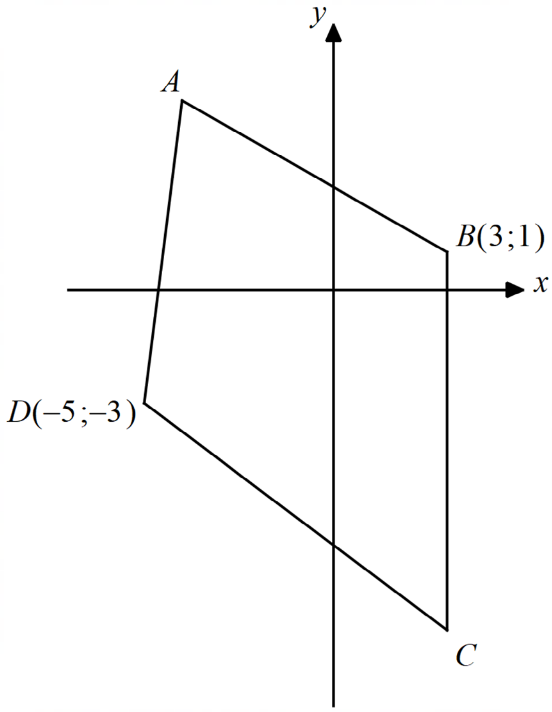
$$\therefore c=-\frac{7}{2}$$

$$\therefore y=-\frac{5}{2}x-\frac{7}{2}\ \checkmark$$



Take it up a notch

2. ABCD is a kite with $B(3;1)$ and $D(-5;-3)$.



Determine the equation of the line passing through A and C. (7)

Midpoint of BD $= \left(\dfrac{-5+3}{2};\dfrac{-3+1}{2}\right) = (-1;-1)$ ✓✓

$m_{BD} = \dfrac{1-(-3)}{3-(-5)}$ ✓ $= \dfrac{1}{2}$ ✓

$\therefore m_{AC} = -2$ ✓ $\quad \ldots\ m_{AC} \times m_{BD} = -1$

$\therefore y = -2x + c$

$\therefore -1 = -2(-1) + c$ ✓

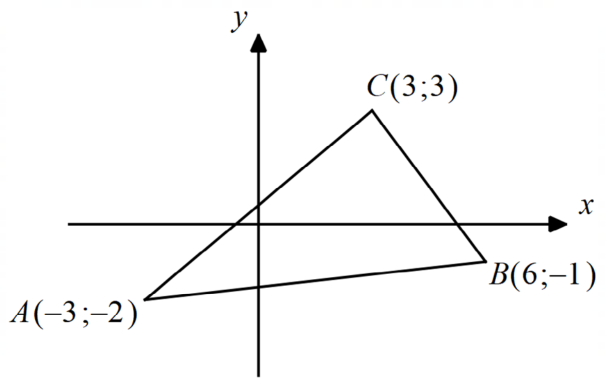
$\therefore c = -3$

$\therefore y = -2x - 3$ ✓

Reach for the stars

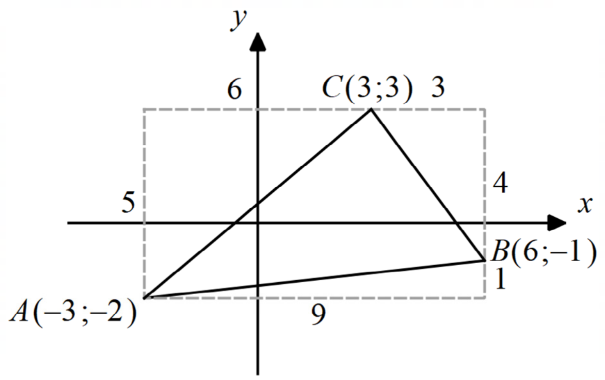
https://www.theanswer.co.za/maths-grade-10-revision-analytical-geometry-2022/

3. Given $A(-3;-2)$, $B(6;-1)$ and $C(3;3)$.



Determine the area of ΔABC. (5)

Draw a rectangle around ΔABC. The area will be the area of the rectangle minus the area of the three triangles.



$$Area = 9\times 5 \checkmark - \frac{1}{2}\times 5\times 6 \checkmark - \frac{1}{2}\times 4\times 3 \checkmark - \frac{1}{2}\times 1\times 9 \checkmark$$

$$\therefore Area = \frac{39}{2} \text{ units}^2 \checkmark$$

An alternative way to do this would be to get the equation of AB, the equation of the altitude passing through C, finding where those two lines intersect, then getting the length of AB and the length of the altitude from C, and using the formula $Area = \frac{1}{2}bh$. The above method is a very nice visual way to do this more quickly!

Trigonometry

Non-negotiable

Calculators may not be used in this question.

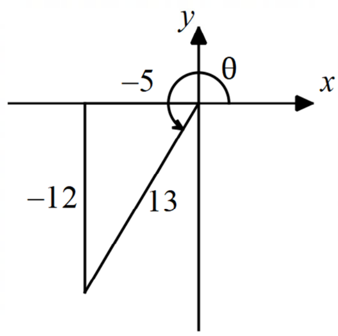
1.1 If $13\cos\theta + 5 = 0$ and $180° < \theta < 360°$, determine the value of $12\operatorname{cosec}\theta - 10\tan\theta$. (6)

$\cos\theta = -\dfrac{5}{13}$ ✓

$(-5)^2 + y^2 = 13^2$

$\therefore y = \pm 12$

$\therefore y = -12$ ✓ … third quadrant



$12\operatorname{cosec}\theta - 10\tan\theta$

$= 12\left(\dfrac{13}{-12}✓\right) - 10\left(\dfrac{-12}{-5}✓\right)$

$= -13 - 24$ ✓

$= -37$ ✓

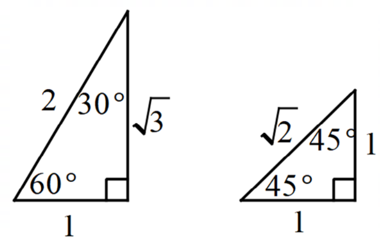
1.2 Determine the value of $\operatorname{cosec}60°\cot30° + \cos45°\operatorname{cosec}45°$. (5)

$\operatorname{cosec}60°\cot30° + \cos45°\operatorname{cosec}45°$

$= \dfrac{2}{\sqrt{3}}✓ \times \dfrac{\sqrt{3}}{1}✓ + \dfrac{1}{\sqrt{2}}✓ \times \dfrac{\sqrt{2}}{1}✓$

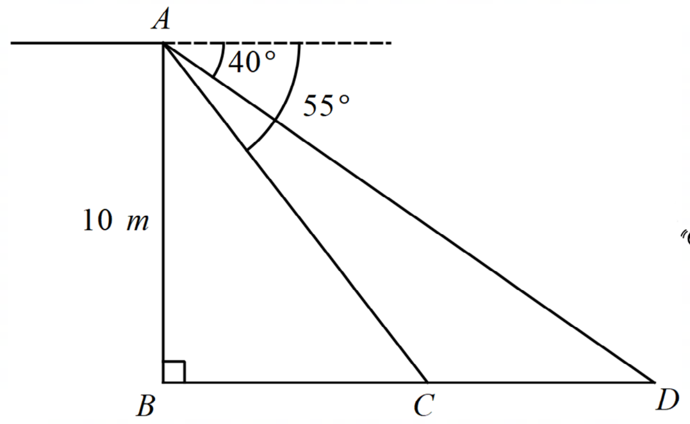
$= 2 + 1$

$= 3$ ✓



Take it up a notch

2. A person stands at the top of a 10 metre building and observes a man standing at point D and a dog at point C. The angle of depression to the man is 40° and to the dog is 55°.



Determine the distance from the man to the dog, i.e. DC, correct to two decimal places. (5)

$B\hat{A}C = 35°$

$\therefore \tan 35° = \dfrac{BC}{10}$ ✓

$\therefore BC = 7{,}00$ ✓

$B\hat{A}D = 50°$

$\therefore \tan 50° = \dfrac{BD}{10}$ ✓

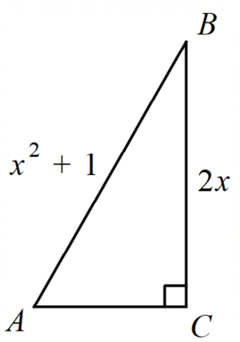
$\therefore BD = 11{,}92$ ✓

$\therefore CD = 11{,}92 - 7{,}00 = 4{,}92$ metres ✓

Reach for the stars

https://www.theanswer.co.za/maths-grade-10-revision-trigonometry-2022/

3. $\sin A = \dfrac{2x}{x^2+1}$ and A and B are complementary. Determine $\tan B$ in terms of x. (5)



$AC^2 = (x^2+1)^2 - (2x)^2$ ✓ … Pythag

$\therefore AC^2 = x^4 + 2x^2 + 1 - 4x^2$ ✓

$\therefore AC^2 = x^4 - 2x^2 + 1$

$\therefore AC^2 = (x^2-1)^2$ ✓

$\therefore AC = \pm(x^2-1)$

If $x > 1$

$AC = x^2 - 1$

$\therefore \tan B = \dfrac{x^2-1}{2x}$ ✓

If $0 < x < 1$

$AC = 1 - x^2$

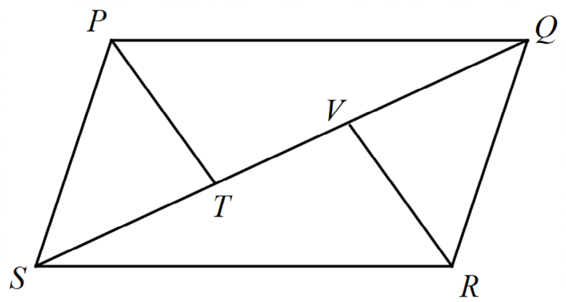
$\therefore \tan B = \dfrac{1-x^2}{2x}$ ✓

If you are not sure how to get these answers, watch the video!

Euclidean Geometry & Measurement

Non-negotiable

1. PQRS is a parallelogram. PT bisects $Q\hat{P}S$ and RV bisects $Q\hat{R}S$.



1.1 Prove that $\Delta PTS \equiv \Delta RVQ$. (5)

In ΔPTS and ΔRVQ

1. $PS = QR$ (opp sides of ||m) ✓
2. $P\hat{S}T = V\hat{Q}R$ (alt ∠s; $PS \parallel QR$) ✓
3. $Q\hat{P}S = Q\hat{R}S$ (opp ∠s of ||m) ✓

$\therefore S\hat{P}T = Q\hat{R}V$ (both bisected) ✓

$\therefore \Delta PTS \equiv \Delta RVQ$ (AAS) ✓

1.2 Hence prove that PVRT is a parallelogram. (4)

$PT = VR$ ($\Delta PTS \equiv \Delta RVQ$) ✓

$P\hat{T}S = R\hat{V}Q$ ($\Delta PTS \equiv \Delta RVQ$)

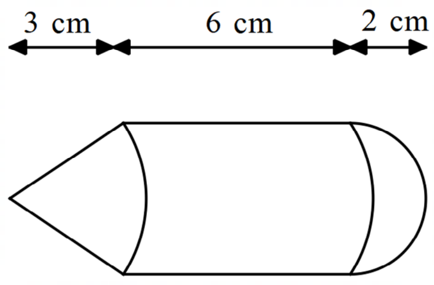
$\therefore P\hat{T}V = R\hat{V}T$ (∠s on a str line) ✓

$\therefore PT \parallel VR$ (alt ∠s equal) ✓

$\therefore PVRT$ is a parallelogram (pair of opp sides = and ||) ✓

Take it up a notch

2. A cone is placed on a cylinder, which is placed on a hemisphere.



Determine the volume of the combined shape, correct to two decimal places. (7)

Radius of all shapes $= 2$ cm … from the hemisphere

Cone: $V = \frac{1}{3}\pi r^2 h$

$\therefore V = \frac{1}{3} \times \pi \times 2^2 \times 3 \checkmark = 4\pi \checkmark$

Cylinder: $V = \pi r^2 h$

$\therefore V = \pi \times 2^2 \times 6 \checkmark = 24\pi \checkmark$

Hemisphere: $V = \frac{2}{3}\pi r^3$

$\therefore V = \frac{2}{3} \times \pi \times 2^3 \checkmark = \frac{16}{3}\pi \checkmark$

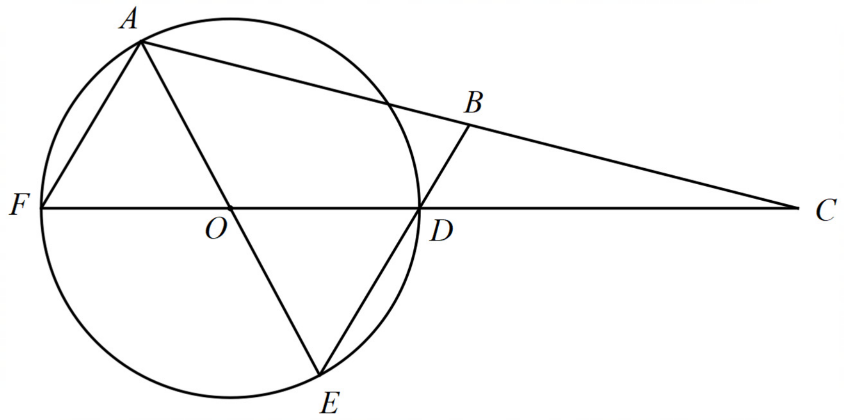
$\therefore V = 4\pi + 24\pi + \frac{16}{3}\pi$

$\therefore V = 104{,}72 \text{ cm}^3 \checkmark$

Reach for the stars

https://www.theanswer.co.za/maths-grade-10-revision-euclidean-geometry-2022/

3. A circle, centre O, passes through A, D, E and F. FD produced and AB produced meet at C. FD = DC.



Determine $ED:DB$. (7)

In ΔOAF and ΔOED

1. $OA = OE$ (radii)
2. $OF = OD$ (radii)
3. $A\hat{O}F = E\hat{O}D$ (vert opp $\angle$s)

$\therefore \Delta OAF \equiv \Delta OED$ (SAS) ✓✓

$\therefore AF = DE$ ($\Delta OAF \equiv \Delta OED$) ✓

and $O\hat{F}A = O\hat{D}E$ ($\Delta OAF \equiv \Delta OED$)

$\therefore AF \parallel DE$ (alt $\angle$s equal) ✓

$\therefore AF \parallel BD$ and $FD = DC$ (given)

$\therefore AB = BC$ (converse midpt thm) ✓

$\therefore BD = \frac{1}{2}AF$ (midpt thm) ✓

$\therefore BD = \frac{1}{2}DE$ ($AF = DE$)

$\therefore ED:DB = 2:1$ ✓