

TEACHERS WITHOUT BORDERS PROGRAMME

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basic education
Department:
Basic Education
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In Bill Gates words, at the Mandela Day 'Living Together' address: "Maintaining the quality of this country's higher education system while expanding access to more students will not be easy. But it's critical to South Africa's future" – working together, we can help achieve this."

Contributing schools to date:

Clifton School	Milnerton High	Rustenburg Girls' High	St Peter's
Durban Girls'	Northwood High	St Anne's DC	St Stithians
Fairmont High	Roedean	St John's DSG	Wynberg Boys' High
Herzlia High	Rondebosch Boys'	St Mary's DSG Kloof	Wynberg Secondary

QUESTION 1

1.1 Indicate whether the following are Rational or Irrational:

1.1.1 $0,8$

1.1.2 $2\frac{1}{6}$

1.1.3 2π

1.1.4 $-\sqrt{3}$

(2)

1.2 Arrange the following in descending order:

$$\sqrt{3} ; \sqrt[3]{2} ; \sqrt[4]{2} ; \sqrt{2} \quad (1)$$

1.3 Represent $x \in (-3 : 6]$ in Set Builder Notation and on a number line.

(4)

[7]

QUESTION 2

2.1 Given the sequence 17; 26; 35;

2.1.1 Give the next 2 terms of the sequence. (1)

2.1.2 Calculate the 25th term. (3)

2.2.1 Is a sequence increasing or decreasing if the common difference is a negative? (1)

2.2.2 Which of the following rules will give a decreasing sequence:

$$T_n = -2n + 4 \quad \text{or} \quad T_n = 2n - 27 \quad (1)$$

2.3. Given the sequence 16; 8; 4; 2;

Find the n^{th} term (3)

2.4 Determine the value of p in the arithmetic sequence below:

$$-27 ; p ; -43 ; \dots \dots \quad (3)$$

2.5 A programme for preparing runners for the Comrades Marathon suggests running 12 km in the first week of training and increasing this distance by 4 km each week for the next 25 weeks.
Determine:

2.5.1 The formula to determine the distance run in any one of the weeks of training. (3)

2.5.2 The week in which 92 km should be run? (2)

2.5.3 By how far will the distance run in the 10th week of training exceed 42,2km, which is the distance of a standard marathon? (2)

[19]

QUESTION 3

Fully factorise the following:

3.1 $a^5 - 4a^3b^4$ (3)

3.2 $27a^3 + 8b^3$ (2)

3.3 $2xy - 6ab - 3ay + 4bx$ (3)

[8]

QUESTION 4

4.1 Simplify the following:

4.1.1 $1 + \frac{2}{a}$ (2)

4.1.2 $\frac{2a+4}{a^2-4} \div \frac{3a-6}{a^2-4a+4}$ (4)

4.2 If $X = \frac{p+q}{p-q}$ and $Y = \frac{p-q}{p+q}$

Determine the following in terms of p and q :

$3(X - Y)$ (4)

[10]

QUESTION 5

Simplify the following and give your answers with positive exponents:

$$5.1 \quad \left(\frac{x^{10}}{y^{-5}} \right)^{-\frac{2}{5}} \quad (3)$$

$$5.2 \quad \frac{6^{a-2} \cdot 3^{3a+1}}{18^a} \quad (3)$$

$$5.3 \quad \frac{7 \cdot 5^m + 5^{m+1}}{5^{m-1} - 5^m} \quad (3)$$

[9]

QUESTION 6Solve for x

$$6.1 \quad 4 - 2(2x - 5) = -(x - 5) \quad (2)$$

$$6.2 \quad dx - eq = fx \quad (2)$$

$$6.3 \quad \frac{1}{x+3} = \frac{x-1}{-3} \quad (4)$$

$$6.4 \quad -7 < 2 - 3x \leq 5 \quad (3)$$

$$6.5 \quad 3^{x^2+5x} = \frac{1}{81} \quad (4)$$

[15]

QUESTION 7

Plane A takes off from King Shaka International Airport heading towards Cape Town International Airport. At the same time plane B takes off from Cape Town International Airport heading towards King Shaka International Airport flying 20km/h slower than plane A. The airports are 1634km apart and the planes meet after 54 minutes.

Calculate the distance from King Shaka International Airport at which they meet and the speed of the planes.

[6]

QUESTION 8Simplify the following correct to **two** decimal places:

$$8.1 \quad \sin 35^\circ \quad (1)$$

$$8.2 \quad \frac{\sin 50^\circ}{\cos 50^\circ} \quad (1)$$

$$8.3 \quad \tan^2 37^\circ \quad (2)$$

[4]

QUESTION 9

Solve the following equations to solve for x correct to one decimal place.

9.1 $\sin x = 0,33$ (1)

9.2 $2 \cos x = 1,64$ (1)

9.3 $\tan(x - 15^\circ) = 1,529$ (2)

[4]

QUESTION 10

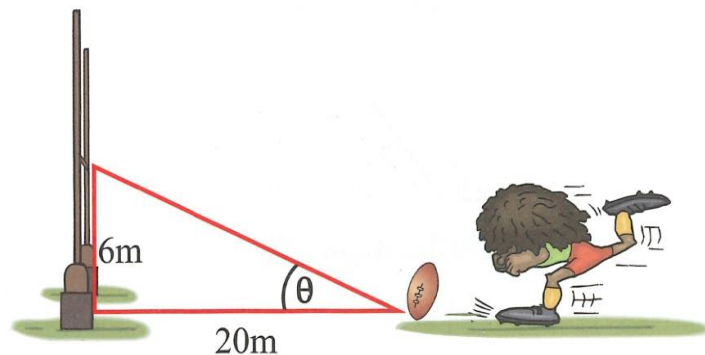
If $13 \sin \theta + 5 = 0$ and $\theta \in [90^\circ; 270^\circ]$, calculate with the aid of a diagram, but without using a calculator, the value of $\cos \theta + \sin \theta$.

[7]

QUESTION 11

Without the use of a calculator and showing all working

Prove that $\sin^2 30^\circ + \cos^2 30^\circ = 1$ [5]

QUESTION 12

In a rugby game, Justin has been awarded a penalty kick. The rugby posts are 6m high and Justin is standing 20m from the centre of the posts.

12.1 Will Justin be able to kick the ball over the posts if he kicks the ball at an angle of 15° ? (3)

12.2 What is the minimum angle (θ) at which Justin must kick the ball in order to score? (3)

[6]

INFORMATION SHEET

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

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

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

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

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

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