Maths 4th ESO

EXAM 1_1 (Real numbers)

Name:____ Group:

1. Use your calculator to work out the following calculations. Express the results in scientific notation. (When you obtain results of more than 3 decimal figures, round them to three decimal places) (1 point)

a) $\left(1.22\cdot 10^{10}\right)\div\left(3.305\cdot 10^{-4}\right)=$

b) $\sqrt[5]{7.6318\cdot 10^{-12}}=$

2. Calculate and simplify (write the steps you have taken to reach the solution): (4.5 points)

a) $\dfrac{\sqrt{2}\cdot\sqrt[4]{20}}{\sqrt[4]{8}}=$

b) $\left(3\sqrt{20}+2\sqrt{80}-4\sqrt{125}\right)\div 3\sqrt{500}=$

c) $2\sqrt[3]{81}-\sqrt[3]{24}+3\sqrt[3]{108}-\sqrt[3]{256}=$

d) $\sqrt{\sqrt[4]{a^2}\cdot\sqrt[3]{a^2}}=$

e) $\left(a-2\sqrt{b}\right)^2-\left(a+2\sqrt{b}\right)^2=$

f) $4\sqrt{\dfrac{75}{4}}+2\sqrt{3}-\dfrac{7}{3}\sqrt{27}+\sqrt{\dfrac{48}{9}}=$

3. Classify according to number type and mark on the real number line the following. (Notice that some numbers may be of more than one type).

(1.5 points)

a) $-\sqrt{11}$

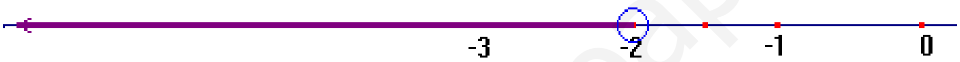
b) $\sqrt{9}$

c) $-0.8\widehat{3}$

4. Use both interval and set notation to describe the interval shown on the graph:

(1.5 points)

a)



b)

c)

5. Rationalize and simplify (write the steps you have taken to reach the solution):

(1.5 points)

$$\frac{\sqrt{2}}{\sqrt{5}+\sqrt{2}}-\frac{\sqrt{2}}{\sqrt{5}-\sqrt{2}}$$

SOLUTION

1. Use your calculator to work out the following calculations. Express the results in scientific notation. (When you obtain results of more than 3 decimal figures, round them to three decimal places)

c) $\left(1.22\cdot 10^{10}\right)\div\left(3.305\cdot 10^{-4}\right)=3.691\cdot 10^{13}$

d) $\sqrt[5]{7.6318\cdot 10^{-12}}=0.005977579\approx 5.978\cdot 10^{-3}$

2. Calculate and simplify (write the steps you have taken to reach the solution):

a) $\dfrac{\sqrt{2}\cdot\sqrt[4]{20}}{\sqrt[4]{8}}=\dfrac{\sqrt[4]{2^2}\cdot\sqrt[4]{2^2\cdot 5}}{\sqrt[4]{2^3}}=\sqrt[4]{\dfrac{2^4\cdot 5}{2^3}}=\sqrt[4]{10}$

b) $\left(3\sqrt{20}+2\sqrt{80}-4\sqrt{125}\right)\div 3\sqrt{500}=\dfrac{3\sqrt{2^2\cdot 5}+2\sqrt{2^4\cdot 5}-4\sqrt{5^3}}{3\sqrt{2^2\cdot 5^3}}=$

$=\dfrac{6\sqrt{5}+8\sqrt{5}-20\sqrt{5}}{30\sqrt{5}}=\dfrac{-6\sqrt{5}}{30\sqrt{5}}=-\dfrac{6}{30}=-\dfrac{1}{5}$

c) $2\sqrt[3]{81}-\sqrt[3]{24}+3\sqrt[3]{108}-\sqrt[3]{256}=2\sqrt[3]{3^4}-\sqrt[3]{2^3\cdot 3}+3\sqrt[3]{2^2\cdot 3^3}-\sqrt[3]{2^8}=$

$6\sqrt[3]{3}-2\sqrt[3]{3}+9\sqrt[3]{4}-4\sqrt[3]{4}=4\sqrt[3]{3}+5\sqrt[3]{4}$

d) $\sqrt{\sqrt[4]{a^2\cdot\sqrt[3]{a^2}}}=\sqrt[8]{a^2\cdot\sqrt[3]{a^2}}=\sqrt[8]{\sqrt[3]{a^6\cdot a^2}}=\sqrt[24]{a^8}=\sqrt[3]{a}$

e) $\left(a-2\sqrt{b}\right)^2-\left(a+2\sqrt{b}\right)^2=a^2-4a\sqrt{b}+\left(2\sqrt{b}\right)^2-\left(a^2+4a\sqrt{b}+\left(2\sqrt{b}\right)^2\right)=$

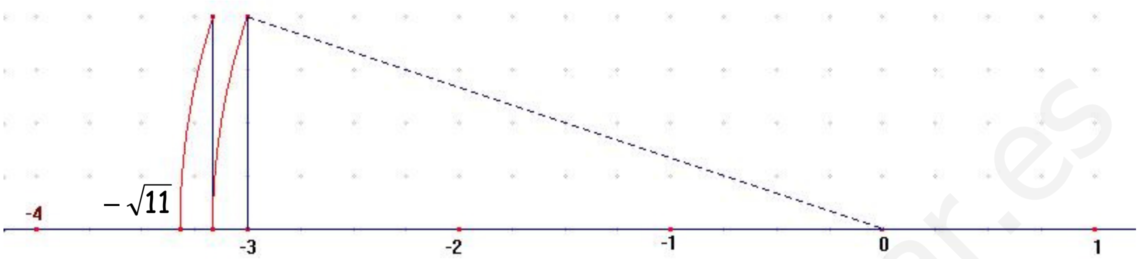
$=a^2-4a\sqrt{b}+4b-a^2-4a\sqrt{b}-4b=-8a\sqrt{b}$

f) $4\sqrt{\dfrac{75}{4}}+2\sqrt{3}-\dfrac{7}{3}\sqrt{27}+\sqrt{\dfrac{48}{9}}=4\sqrt{\dfrac{3\cdot 5^2}{2^2}}+2\sqrt{3}-\dfrac{7}{3}\sqrt{3^3}+\sqrt{\dfrac{2^4\cdot 3}{3^2}}=$

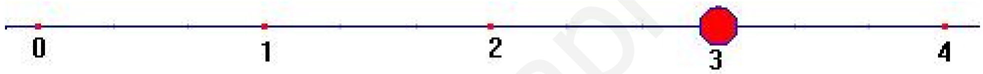
$=\dfrac{20}{2}\sqrt{3}+2\sqrt{3}-\dfrac{21}{3}\sqrt{3}+\dfrac{4}{3}\sqrt{3}=\left(10+2-\dfrac{21}{3}+\dfrac{4}{3}\right)\sqrt{3}=\dfrac{19}{3}\sqrt{3}$

3. Classify according to number type and mark on the real number line the following. (Notice that some numbers may be of more than one type).

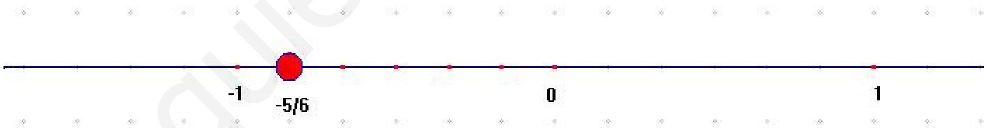
a) $-\sqrt{11}$, real, irrational



b) $\sqrt{9}$ =3 real, whole number, natural



c) $-0.8\widehat{3} = -\dfrac{5}{6}$ real, rational, recurring decimal



4. Use both interval and set notation to describe the interval shown on the graph:

a) Interval $(-\infty,-2)$; set $\{x \in \Re \,/\, x < -2\}$

b) Interval $[-1,4)$; set $\{x \in \Re \,/ -1 \leq x < 4\}$

c) Interval $[-2,+\infty)$; set $\{x \in \Re \,/\, x \geq -2\}$

5. Rationalize and simplify:

$$\frac{\sqrt{2}}{\sqrt{5}+\sqrt{2}}-\frac{\sqrt{2}}{\sqrt{5}-\sqrt{2}}=\frac{\sqrt{10}-2}{3}-\frac{\sqrt{10}+2}{3}=-\frac{4}{3}$$

$$\frac{\sqrt{2}}{\sqrt{5}+\sqrt{2}}=\frac{\sqrt{2}\left(\sqrt{5}-\sqrt{2}\right)}{\left(\sqrt{5}+\sqrt{2}\right)\left(\sqrt{5}-\sqrt{2}\right)}=\frac{\sqrt{2}\left(\sqrt{5}-\sqrt{2}\right)}{\left(\sqrt{5}\right)^2-\left(\sqrt{2}\right)^2}=\frac{\sqrt{10}-2}{3}$$

$$\frac{\sqrt{2}}{\sqrt{5}-\sqrt{2}}=\frac{\sqrt{2}\left(\sqrt{5}+\sqrt{2}\right)}{\left(\sqrt{5}+\sqrt{2}\right)\left(\sqrt{5}-\sqrt{2}\right)}=\frac{\sqrt{2}\left(\sqrt{5}+\sqrt{2}\right)}{\left(\sqrt{5}\right)^2-\left(\sqrt{2}\right)^2}=\frac{\sqrt{10}+2}{3}$$